

# The Chemical Age

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## Contents

|  | PAGE |
|--|------|
| Editorial Notes : A Model Factory Costs System ; Dr. Maxted on Ammonia Synthesis ; The Cyanamide Process ; Medical Prescriptions ; Sir Alfred Mond's Libel Action ; What is a Gas Engineer ? | 587  |
| The Calendar   | 589  |
| The Synthesis of Ammonia (III). By E. B. MAXTED, Ph.D., B.Sc.  | 590  |
| Department of Explosives Supply : Statistical Work of the Factories Branch (II)  | 592  |
| Society of Public Analysts   | 594  |
| Chemistry in Gas Works, Shipyards, and Paint Works   | 595  |
| Society of Chemical Industry : Manchester, Yorkshire, and Edinburgh Sections   | 596  |
| Treatment of Gas Works Residuals   | 597  |
| Nitrogen Products and Carbide Co.  | 597  |
| Import of German Dyestuffs   | 598  |
| From Week to Week  | 599  |
| Chemical Matters in Parliament   | 600  |
| References to Current Literature   | 601  |
| Patent Literature  | 602  |
| Monthly Market Report and Current Prices   | 605  |
| Commercial Intelligence  | 607  |

**NOTICES** :—All communications relating to editorial matter should be addressed to the Editor who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

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## A Model Factory Costing System

We give elsewhere some further extracts from the account of the statistical work of the Explosives Department during the war recently published by the Ministry of Munitions as a companion volume to the Department's "Second Report on Costs and Efficiencies of H.M. Factories controlled by the Factories Branch." The present report contains matter of the greatest technical interest not only to statisticians and costing experts but to the general chemical manufacturer and his staff, and the clear and detailed account given of the Department's statistical work cannot fail to be of great benefit to the chemical industry of the country. We welcome it, not only for this reason, but because it goes far to assist in breaking down those barriers of reserve and secrecy in our industry, the existence of which we have so often deplored. The Department is to be congratulated on its wise and bold foresight in making available such valuable information. That the report was not originally compiled for publication may be deduced from the words "For Official Use," which appear on the cover, and the action of the Government in now offering it for circulation is all the more

welcome. Incidentally, its appearance will assist in spreading still wider the realisation of what was accomplished by the Department during the war. It is understood that the Department proposes to issue further reports, describing the plant and processes in operation in the larger national factories, with plans and photographs, tables of plant constants, physical data, results and efficiencies, etc., which will be of enormous value to the acid industry especially, and, as examples of methods of mass production, to chemical industry generally.

Those acquainted with the personnel of Lord Moulton's staff will have little difficulty in ascribing the methods and activities described in the report to the inspiration of that great technologist, Mr. K. B. Quinan. Summoned from South Africa shortly after the outbreak of the war, Mr. Quinan placed his great knowledge and wide experience, his wonderful energy and driving force, unreservedly at the disposal of this country and her Allies. His conception of the importance of statistics as an aid, nay, as a necessity, to efficient scientific control of plant was well known, and was driven home at each and every opportunity to all those members, both of the Department's staff and of the chemical industry of the country, with whom he came into contact. The results he achieved may be seen from the "Second Report on Costs and Efficiencies"; the methods employed in obtaining and presenting the necessary data are described in the report now under review. The Report has obviously been drawn up with a view to making it useful to the widest possible circle of industrialists and technologists, beyond those actually interested in or concerned with explosives manufacture. The aim seems to have been to use the explosives industry as a typical case in explaining the methods of costing employed. Three series of records are described in detail, namely, those dealing with the actual quantities handled on the plant, those dealing with the actual costs and their analysis, and those dealing with the "comparative" costs and their presentation. The last, to which the first two are subsidiary, were drawn up for circulation to all the factories, and were presented both in tabular and in graphical form in such a way as to allow of the fairest comparison of costs and efficiencies, as between the various factories, compatible with the different conditions in each. Very complete sets of cost sheets and cost analysis sheets form a most valuable feature of the report.

To advocate the necessity of cost and efficiency data is not, as some of the more zealous exponents of their virtues have often proclaimed, to cast pearls before those deemed unfortunately unable to appreciate such things. It is certainly true that it has not been the custom in British chemical industry to utilise such systems to the extent employed by the Explosives Department. Most of us recognise, however, that the manufacturer, whilst

he must avoid going too far in matters of this kind, cannot afford to be without a costs and statistics system so complete and so drawn up as to enable him to see at a glance every change in efficiency on his plant, and the exact effect in cash terms of every alteration in the chemical, engineering, and human factors in his works. In the fashioning of such a system, each must be guided by his own particular circumstances, but the timely issue of this report on the Government methods affords a model that no one can afford to ignore.

### Dr. Maxted on Ammonia Synthesis

WE publish this week the final instalment of Dr. Maxted's contribution on "The Synthesis of Ammonia"—a contribution which will be widely appreciated for its clear style and its mastery both of technique and economics. It will be noticed that Dr. Maxted pays particular attention to one or two salient facts frequently overlooked by more casual writers. While confessedly an advocate of synthetic production in this country, he does not attempt to disguise the difficulties to be faced by those who intend to instal plant of the kind on a working scale. In the first place, the vagueness of the international position with regard to the validity of the Badische master-patents is decidedly unsatisfactory, and the least that any firm contemplating erection could expect is that its legal standing should be definitely assured, and that it should be immune from interference during future operations. It is suggested that the Badische concern itself might be willing to participate in any proposed undertaking in this country; and, although the first-hand knowledge available from such an arrangement would, no doubt, save a good deal of large-scale experimental work, we fancy that the British chemist would prefer to trust to his own resources, even though the experience of the venture might be costly. Dr. Maxted is on sound ground when he suggests that the importance of the process warrants a Government subsidy, and it is worth noting that, although a considerable amount of preliminary small-scale work has been carried out at the country's expense, the practical scale unit was nipped in the bud by the cessation of hostilities. As, however, nitrogen fixation is as important in peace as in war, it is a little difficult to understand why the strings of the Imperial purse should so suddenly have been drawn together. For the moment it seems as though the only solution is for some powerful and wealthy corporation to take the matter over where the Government left it, and from rumours which reach us we understand that it may not be long before something of the kind occurs. At any rate, it is a matter for satisfaction that the future of the home-produced nitrogen industry is about to pass from departmental control into the hands of private enterprise.

So far as the actual manufacture of synthetic ammonia is concerned, it is well to remember that the cost of the final product is closely allied with the method and cost of producing hydrogen. In this connection it is desirable that deeper attention should be given to a comparison between the various hydrogen processes now available. So far as ammonia production in any quantity is concerned, it seems that in this country hydrogen manufacture means coke, and coke at the present time is an expensive fuel. Accordingly, while the iron

contact process may be preferable from the standpoint of impurities, the steam-catalytic method gives double the volume of hydrogen per unit weight of coke. It yet remains to be seen, however, whether the purified hydrogen from the latter system is going to be the cheaper product in the long run.

### The Cyanamide Process

FROM our report, which appears elsewhere, of the annual meeting of the Nitrogen Products and Carbide Company, it will be noted that Major C. H. Campbell dealt with the prospects of the Haber method in a decidedly critical manner. His company, of course, obtains its ammonia by quite a different means, namely, by treating cyanamide ( $\text{CaCN}_2$ ) at a temperature of about 160 degrees. Major Campbell is of opinion that a great deal of misunderstanding exists as to the possibilities of the Haber method as compared with the cyanamide process. While recognising the ingenuity of the method adopted for effecting combination between hydrogen and nitrogen, he holds that the operations are of so involved a nature that technical skill of the highest order is essential for success.

While partly agreeing with this point of view, we are inclined to think that his remarks are a little unhappy, and we see no reason why difficulties which can be surmounted by the average plodding and automatic German should be too intricate to be mastered by our own chemists. The Germans, we know, boast that successful operation depends upon the "special skill which they alone have acquired." We have come up against these vainglorious pretensions before, and, no doubt, they are to an extent a highly useful deterrent when dealing with possible rivals in industry. No one will, of course, gainsay the merits of the cyanamide process, but those who advocate other methods do so because they are anxious for the ammonia industry to be a home-produced one from start to finish. If ammonia is to be manufactured from cyanamide, it will be generally conceded that the cyanamide must first be imported, for abundant water-power is regarded as the *sine qua non* of its production, and in this respect our national resources are unfortunately meagre. Certainly, the Haber process demands coal, or fuel derived from the use of coal, both in the direction of the power required for compression, and in connection with the coke demanded for hydrogen manufacture. But, in these days, when the utilisation of raw coal is beginning to be regarded as a crime, there are immense opportunities for the linking up of synthetic ammonia plants with the coke-oven business. In this way the gas evolved might supply all the needful power, while the coke would work in for hydrogen manufacture. However, as Dr. Maxted says, it would seem very desirable that cyanamide and synthetic ammonia plants should be operated side by side, with a view to deciding the relative merits and demerits of each process.

### Medical Prescriptions

In the King's Bench Division of the High Court on Saturday an important judgment was delivered on the question whether the dispensing of a prescription by a chemist for a customer constitutes the sale of an article within the meaning of the Profiteering Act, 1919. The facts were quite simple. A prescription was taken to

Boots Cash Chemists (Southern), Ltd., and they offered to make it up for 3s. 4d. It was also taken to Mr. Coulter, a chemist, who offered to make it up for 5s. 6d. It was later taken to a chemist in New Bond Street, who made it up for a smaller fee. On a complaint being made to the Wood Green Profiteering Committee, it was objected on behalf of the two firms that the Committee had no jurisdiction. The argument was that the fee was charged not solely for the drugs, but for the technical knowledge and skill in dispensing them, and that, therefore, there was no sale of a commodity in the ordinary sense. The Board of Trade Order of October 14 applies the provisions of the Act to "all drugs (excluding quinine sulphate, which is controlled), and medicinal preparations, including tooth powders, talcum powder, and Fuller's earth." In the course of the hearing in the High Court it was urged by counsel for the two firms that the sum charged for the whole transaction was not the price paid on the sale of the article. It was a compound sum made up of the price of the ingredients together with the value of the skill and service rendered in making it up. The Profiteering Committee, it was contended, could investigate the price of an article sold, but not a case where the sum paid was a compound of the price of the ingredients and the value of the services rendered. The Court, however (consisting of the Lord Chief Justice, Mr. Justice Coleridge, and Mr. Justice Sankey) unanimously decided against this view, and ruled that the sale of a bottle of medicine made up from a prescription was the sale of an article. This judgment, it ought, perhaps, to be pointed out, does not necessarily imply that the fees proposed to be charged for the prescription in question were excessive; it merely decides that the making up and sale of a prescription comes under the Profiteering Act, and that the fees are liable to review by a profiteering committee.

### Sir Alfred Mond's Libel Action

SIR ALFRED MOND and Mr. Robert Mond may be congratulated on the conclusive result of their action for libel against a South Wales journal and its editor. The action, it need hardly be pointed out, was brought not to recover monetary damages, but to vindicate character, and this object was completely attained. Not only were all accusations against the loyalty of the plaintiffs publicly withdrawn, but the hearing elicited from Lord Moulton the warmest testimony to the whole-hearted support his Explosives Department received both from Sir Alfred Mond, who voluntarily approached Lord Moulton with an offer of help, and from the Brunner Mond Company, whose chemical and technical staff, together with their whole organisation, were placed without reserve at his disposal. When the demand for immense quantities of nitrate of ammonia arose the Brunner Mond Company first undertook the conversion of nitrate of lime, obtained from Norway, into nitrate of ammonia, and later enormously supplemented the supply by means of their soda-ammonia and other processes. They thus made what was described as a "perfectly essential" contribution to the winning of the war. In addition to his testimony to the work of Sir Alfred Mond, Lord Moulton paid an almost affectionate tribute to the late Dr. Ludwig Mond, described in the course of the trial as "the pioneer of industrial chemistry" in this country. When asked whether Dr. Mond was a

loyal citizen of this country, the answer was that "such a question in his life-time would have been too absurd"—an opinion which will be readily confirmed throughout the chemical industry. The effect of the action should be to discourage the habit, which has grown during the war, of indulging in generalisations too often quite unsupported by facts.

### What is a Gas Engineer?

It will be noticed that in the interesting paper which Mr. Geoffrey Weyman read before the Newcastle Chemical Industry Club he referred to the fact that it is the chemist who really plays the most important part in the control of gas works. His remarks, in fact, open up the old question as to what is a gas engineer, and on what lines his training should be conducted? During the past century the man at the helm in the gas works was invariably an engineer first and a chemist a bad second, if at all. The result was that, whereas substantial buildings and well-designed plants were erected, little progress was made in the economy of the carbonisation process. It is due to the chemist, however, to say that it is only since his value has been recognised by the gas undertakings that the immense possibilities of carbonisation, and its influence on the problem of coal conservation, have been fully appreciated. The modern gas engineer, if he means to excel, must be prepared to combine the qualities of civil engineer and industrial chemist, and although the study of two so dissimilar subjects may prove a trifle exacting, the man who is content to become master of both will inevitably find that he can go about his daily round with unusual satisfaction and interest.

### The Calendar

|         |   |   |
|---------|---|---|
| Nov. 18 | Sheffield Association of Metallurgists and Metallurgical Chemists. "Tungsten Distribution in Crucible Steel," by G. Batty.  | Royal Hotel, Victoria Assembly Room, Sheffield. |
| 18      | "Seed Crushing," by B. P. Flockton, M.I.M.E. (Manlove, Alliott & Co., Ltd.).  | Manchester Municipal College of Technology.     |
| 20      | Chemical Society. Ordinary Scientific Meeting and Informal Meeting.   | Burlington House, Piccadilly, W. 1.             |
| 25      | Sheffield Association of Metallurgists and Metallurgical Chemists. "Notes on the Tensile Test," by G. Stansfield, B.Sc.   | Royal Hotel, Victoria Assembly Room, Sheffield. |
| 25      | "Evaporation," by H. J. Pooley (George Scott & Son (London), Ltd.).   | Manchester Municipal College of Technology.     |
| Dec. 2  | "Evaporation" by H. J. Pooley (George Scott & Son (London), Ltd.)   | Manchester Municipal College of Technology.     |
| 2       | "Chromium Steels," by C. A. Edwards, D.Sc.  | Royal Victoria Hotel Assembly Room, Sheffield.  |
| 5       | Society of Chemical Industry. (a) The Activated Sludge Process of Sewage Purification. By E. Ardern, D.Sc. (b) A New Method for Determining the Relative Temperatures of Spontaneous Ignition of Coals. The Influence of Degree of Fineness and Volatile Matters on the Results. By Capt. F. S. Sinnatt, M.B.E., and Burrows Moore, M.Sc.Tech., B.Sc., Eng., A.I.C. | Grand Hotel, Manchester.                        |

## The Synthesis of Ammonia.—(III)

By E. B. Maxted, Ph.D., B.Sc.

We give below the third and concluding instalment of Dr. Maxted's valuable contribution on "The Synthesis of Ammonia." In this the relation between the direct synthesis of ammonia and the alternative methods of nitrogen fixation are discussed from the economic standpoint. The first and second instalments were published respectively on October 25 and November 1.

In considering the synthesis from an economic standpoint it is at once evident that the production cost of synthetic ammonia hinges on that of hydrogen, as well as, to a secondary extent, on the rate at which power can be obtained for compression, the latter factor, although smaller than for other nitrogen fixation processes, with the exception, perhaps, of those involving the synthesis of cyanides—a short discussion of which will be given below—being by no means negligible. Each of these factors depends directly on the cost of fuel, in that coke is the raw material from which hydrogen is usually produced, so that the present conditions in this country—with fuel at three times its pre-war cost—cannot lead to the manufacture of extremely cheap fixed nitrogen by this, or, indeed, by any other process utilising coal or coke.

The altered fuel position will, of course, still further intensify the necessity for mechanical and other refinements in the process employed for hydrogen production, particularly with a view to obtaining the highest possible ratio of gas produced to coke utilised. This point has been developed to a high degree in the so-called continuous process—which depends on the catalytic reaction of the carbon monoxide of water gas with steam—principally by utilising the heat evolved by the reaction



as the means of maintaining the temperature during the course of hydrogen production. A drawback of the process, from the standpoint of an ideal method of hydrogen manufacture, is the necessity for the subsequent removal of very large quantities of carbon dioxide, an operation which is, however, easily carried out by means of water (the whole system of hydrogen production being operated under pressure), but the carbon monoxide content of the remaining gas is too high to be rendered catalytically innocuous by mere conversion into methane, and has to be removed as formate or by means of calcium carbide. For this reason it is not impossible that a corresponding effort will be made to introduce further mechanical improvements into the so-called intermittent process, with a view to reducing the greater coke : hydrogen ratio now necessary when working intermittently, a particular incentive to this being the high purity of the hydrogen which can be obtained from an intermittent plant.

The present-day fuel conditions are, further, such that may well cause serious attention to be given to the possibilities of utilising water power for the generation of electrolytic hydrogen, with its many attendant advantages, and there exists, in addition, the often discussed supplies of waste hydrogen from electrolytic caustic soda plants.

It is also to be noted that the prime cost of a synthetic ammonia factory erected under the present abnormal conditions will entail very considerably increased dead charges in connection with the ammonia produced, and that such an installation will be, from this viewpoint, in a disadvantageous position with respect to works erected after the highly probable general decrease in prices. As a set-off to this, the price of ammonium sulphate has risen considerably—from £20 to £22 per ton being quoted for 1920 deliveries—but, while a factory now erected would possess the material advantage which lies in a longer experience and

working, in comparison with possible subsequently erected competitors, it is doubtful whether, from a purely business standpoint, the handicap which would be suffered by the pioneer factory, both from the inevitable adjustment costs entailed by a first plant and from the disadvantage at having come into being during a period of unprecedented erection costs, would be compensated for by the attendant advantages of an earlier erection.

The reaction is, however, of such vital importance as a source of agricultural fertiliser, which may well be capable of rendering this country—if at any time the necessity should again arise—to a high degree independent of sea-borne food cargoes, that regarded from a standpoint of national economy, it would be highly deplorable merely to stand by either until a group of sufficient financial strength should undertake the erection of a factory of this nature, in spite of the present unfavourable conditions, or until these conditions themselves should change. It is probable, indeed, that the importance of the process, from the aspect referred to above, is sufficient to warrant an energetic movement for the immediate establishment of a synthetic ammonia factory here, even in view of the present abnormal cost of machinery. In order to ensure the highest possible efficiency of the plant put down, all the available information and experience which exists in this and allied countries might well be pooled, either with or without such experience as the Badische Company themselves might be willing to place at the disposal of the undertaking, all in return, of course, for an equitably adjusted consideration.

From a financial standpoint, some compensation for the present unfavourable time for purchasing plant might be needed in order to render the proposal reasonably attractive, but it is not impossible that the national desirability of the immediate establishment of a nitrogen fixation factory of this nature might be held sufficient for application to be made to the Government for some form of subsidy—or possibly for a guarantee of dividend during, say, the first five years of working. A precedent for the national encouragement of vital chemical industries has been made in connection with the manufacture of dyes, and such direct or indirect Government support is, of course, the standard method by which most of the more important industries have been nursed in Germany to a hardy and profit-bearing stage. The patent position would, if the Badische Company themselves were willing to participate in the suggested undertaking, automatically become clear, otherwise the legal standing of the production of ammonia would have to be assured, either by applying for compulsory licences where required, or by an official assurance respecting non-interference with future working.

In connection with the purely business aspect of the production of synthetic ammonia, due regard must be given to the danger in starting a difficult industry of this nature without sufficient financial and technical backing. The initial stages of a new catalytic process are almost invariably the reverse of smooth, but the brilliant example, referred to above, of the recent coming into being of an adequate British dye production, may well serve as a stimulus for other, if possible, even more necessary chemical industries, paramount among which must stand the production of fixed nitrogen.

It is further to be remembered that, while affording an exceedingly promising solution of the nitrogen problem, the direct synthesis of ammonia forms one of a series of alternative methods of nitrogen fixation, some only of which are suitable for working in this country. Probably the alternative reaction of the greatest interest consists in the formation of calcium cyanamide, by way of carbide, a process which, while admittedly less efficient from the standpoint of ratio of energy used to nitrogen fixed, offers advantages by reason of its simplicity. The stage involving the manufacture of carbide, which was formerly principally carried out in Norway, is, it is believed, now operated to some extent in this country, in addition to the subsequent conversion of carbide to cyanamide by reaction with nitrogen, usually in the presence of a catalyst such as calcium chloride.

In this connection, the production of cheap electrical energy, for carbide manufacture and other purposes, from generating stations built directly over coalfields, will not be possible so long as the general fuel situation continues, and, in any case, the really cheap production of carbide and cyanamide must to a high degree depend on the adequate development of our resources of water power, not only from rivers, but also from tidal estuaries and firths. The manufacture of carbide involves, of course, the use of a certain quantity of fine coal as raw material, the equation



requiring about 40 per cent. of the total weight of carbide produced.

In spite of its theoretical inefficiency, the carbide-cyanamide process works well and smoothly in practice, and undoubtedly forms a ready method of obtaining a regular output of combined nitrogen. It would, from every viewpoint, seem very desirable that carbide furnaces and synthetic ammonia plants should be operated side by side, with a view to deciding, under the actual conditions which obtain in this country, the relative extent of the merits and demerits which each process possesses.

The remaining methods of nitrogen fixation consist of the arc process, involving the direct synthesis of nitric oxide, the high temperature synthesis of nitrides such as that of aluminium, and finally reactions involving the production of cyanides.

The arc process, as such, is far less efficient, from the point of view of the energy ratio, even than the production of cyanamide, and, although requiring no raw materials other than air and water—or in some cases lime (for the manufacture of crude calcium nitrate and nitrite)—would seem to be commercially inapplicable to this country, where water power, even if systematically developed, can never become available as cheaply as under the conditions which exist in Norway. The formation of aluminium nitride appears also from similar economic reasons, not to be very suitable for adoption under British conditions.

The manufacture of cyanides, on the other hand, shares with synthetic ammonia the advantage of not necessitating the supply of electrical energy at a rate which can only be obtained from water power under ideal conditions, and is thus independent of locality. In particular the synthesis of alkali cyanides in presence of iron as a catalyst, and of barium cyanide without the use of special activating agents, have attracted special attention. From a casual viewpoint, the reactions in question appear to be nearer the ideal solution of the nitrogen problem than any yet discussed, not even excepting the direct synthesis of ammonia, in that the temperature as well as the power factor are both relatively low, and no complicated plant is necessary. The formation of sodium cyanide is found to take place fairly rapidly even at  $900^{\circ}$ , while barium cyanide requires a temperature of about  $1,400^{\circ}$  C., but the highly poisonous nature of the products, together with the difficulty in converting them

into less dangerous bodies, would seem to preclude their direct or indirect use in agriculture. The alkali or alkaline earth cyanides, moreover, possess undesirable properties at high temperatures, by reason of their deteriorating action on the vessels employed, and, on the whole, while yielding a product which, as a cyanide, is probably capable of being manufactured much more cheaply than by the interaction of sodium, ammonia and carbon, the reactions in question do not, in their present form, appear to be specially applicable to the production of agricultural fertilisers.

An important supplementary source of ammonia to that produced by direct or indirect synthesis, will, of course, always be found in that recovered during the carbonisation of coal, including the complete gasification of fuel in producers of the Mond type. Ammonia produced in this way possesses a peculiarity which is of frequent occurrence in processes involving the simultaneous manufacture of two or more products, in that its selling price is to a high degree elastic, the proportioning of the total manufacturing cost among the various products obtained—in this case coke, gas, ammonia, and other by-products—being determined principally by the relative values which each of the bodies in question happens to possess. The supply of fixed nitrogen from by-product recovery plants, which forms at the present time the principal source of ammonia in this country, is capable of very considerable extension, particularly by discouraging the use of raw coal under boilers, and employing, not only for steam raising but for all possible purposes, gas produced under conditions attended by the recovery of all available by-products, or, as an alternative, coke. The price of gas-works sulphate will, with the increased application of synthetic processes for nitrogen fixation, necessarily fall to a level corresponding with that produced by the latter means, and, as a combined result of the two sources of supply, nitrogenous fertilisers should, provided that adequate attention is given to the synthetic side, gradually become available at a rate sufficiently attractive to stimulate the greatly increased use, which is of such vital importance in intensifying agricultural production, not only during periods of possible isolation, but also in normal times.

A somewhat important problem in connection with the production of suitable salts for use as fertilisers, from whatever source the ammonia may be made, consists in the relatively large quantities of sulphuric acid required for neutralisation purposes. As an alternative, ammonium nitrate can, of course, be made, without the use of an extraneous acid, by oxidising one half of the ammonia to nitric acid; but, in any case, ammonium nitrate, by reason of its deliquescent nature, is not very suitable for agricultural use, in spite of its relatively high nitrogen content, and, as far as can be seen at present, ammonium sulphate would seem to constitute a far more useful salt for commercial production. The making of sulphate, further, does not necessarily involve evaporation and crystallisation, since on merely adding gaseous ammonia and concentrated sulphuric acid to a saturated solution of ammonium sulphate (with due precautions for the dissipation of the reaction heat), the salt crystallises out as fast as it is formed, and with the removal of the sulphate crystals at suitable intervals, the process can be continued indefinitely. It is also possible to dispense entirely with the use of sulphuric acid, as such, by substituting a naturally occurring sulphate such as gypsum and utilising the waste carbon dioxide resulting from the manufacture of hydrogen for carrying out a reaction of the type represented by the equation—



Reactions of this nature have received considerable attention in Germany, by reason of the sulphuric acid shortage, and their future development is to be looked for with considerable interest.

In conclusion, the views which have been developed in the

present article may be summed up in stating that undoubtedly the most suitable means of attacking the nitrogen problem in Great Britain might well consist in immediate and energetic movement along the three lines represented by the direct synthesis of ammonia, the production of cyanamide, and, as a necessary part in the modern campaign against waste, the general discouragement of the uncontrolled combustion of raw coal, unless accompanied by by-product recovery.

The direct synthesis calls for special treatment by reason of its economic possibilities, combined with its technical difficulties in operation, and, in deciding the relative value of this method of fixation, compared with the more easily operated cyanamide process, parallel factories would have to be conducted under conditions such that the entire working of each in practice was freely accessible for the purpose of making the required comparison.

## Department of Explosives Supply

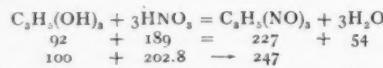
### Statistical Work of the Factories Branch.—(II)

Last week we published an abstract of the first portion of this report, describing the methods adopted in connection with the manufacture, concentration, etc., of the essential acids. We give below the remaining portion of the Report, which deals with the manufacture of T.N.T., Tetryl, Synthetic Phenol, etc.

#### Treatment of the Nitrated Material to Obtain Finished Explosive

As the process of manufacture varies very considerably with the nature of the material to be nitrated, each procedure must be considered separately. The manufacture of nitroglycerine must be carried out at low temperatures in order to avoid the danger of decomposition or explosion should the reaction become too violent. The operation is carried out in heavy leaden vessels fitted with appliances for air agitation and with cooling coils through which can be circulated brine which has been cooled to the necessary temperature by means of a refrigerating plant. The mixed acid is measured into the nitrator, and the pure glycerine introduced into it. Nitration occurs very readily, and the complete charge of some 1,200 lb. of glycerine is generally nitrated within an hour. The agitation is then stopped and the mixture allowed to settle, usually during two or three hours. The nitroglycerine rises to the surface of the waste acids and is displaced through the top of the nitrator to the adjacent washing plant by introducing at the bottom of the nitrator waste acid from a previous charge. The nitroglycerine is then washed free from acid, the last traces being removed by the addition of soda ash. After filtration the nitroglycerine is added in measured quantities to dry nitrocellulose contained in rubber-lined bags, the mixture being subsequently worked up into cordite. The records for the nitration of glycerine and for paste mixing indicate, therefore, the amount of glycerine, and the amount and composition of the mixed acid used; the quantities of waste acid and nitroglycerine produced, and the quantity of nitroglycerine which is "poured on," i.e., added to dry nitrocellulose.

The numerical relationships which govern the manufacture are as follows:—



from which 100 parts of pure glycerine require 203 parts of  $\text{HNO}_3$  and should produce 247 parts of nitroglycerine.

#### Cellulose for Nitrocellulose

The manufacture of nitrocellulose is analogous to that of nitroglycerine, in that nitration must be carried out at a low temperature in order to avoid decomposition or "fuming-off," but differs from it in that nitration is usually carried out in earthenware pans, and only small quantities of cotton are nitrated at each charge. The ratio of the mixed acid used to the cotton nitrated is very high, and this involves the handling of large quantities of spent acid. The charge of cooled fresh acid is run into a nitrating pan and the weighed charge of dry cotton is submerged in it handful by handful by means of aluminium forks. When all the cotton has been introduced a perforated cover-plate is placed on top of the cotton, and a thin film of water is run over the surface to absorb the acid fumes evolved. After nitration is complete, the cock at the bottom of the pan is opened and the acid allowed gradually to drain away, water being run on to the surface at such a rate as to balance the speed at which the acid runs away. This process is known as "displacement." The waste acid does not differ very greatly in composition from the

original mixture used, only a small proportion of its nitric acid content having been replaced by water. It is divided into two parts, the greater part being "revivified," that is, brought up again to the composition of the original mixed acid by the addition of a specially prepared revivifying acid rich in nitric acid and of very low water content, while the smaller fraction of the spent acid is treated for the recovery of the nitric and sulphuric acids. The proportion to be revivified depends upon the acid balance throughout the section. After the acid has been displaced, the nitrated cotton is removed from the nitrating pan and is subjected to a lengthy treatment to remove the last traces of acid, and to ensure absolute uniformity of composition and of physical condition. This uniformity is absolutely essential in the manufacture of propellant explosives, in order that known and steady pressures may be developed in the guns in which the material is used. The finished nitrocellulose contains 30-50 per cent. of water. In this condition it is relatively safe, and may be transported or subjected to ordinary handling without fear of any explosion. Wet nitrocellulose does not, however, generally find use as an explosive without further preparation. Usually, it is employed for the manufacture of cordite, and sometimes for the manufacture of nitrocellulose powder.

#### Cordite

Cordite is obtained by the admixture in suitable proportions of nitrocellulose and nitroglycerine, and the subsequent gelatinisation by means of solvents of the "paste" so produced, after the addition of mineral jelly. Since the paste must be free from moisture, it is necessary that the nitrocellulose used in its production should be freed from moisture by some suitable method. This can be effected in two ways, viz., either by removing the water by hot air in drying stoves, or by replacing the water by means of one of the solvents required for the subsequent gelatinisation of the paste. Nitrocellulose is therefore freed from water as far as possible in presses or centrifugal wringing machines, and is then conveyed either to the stoves, in which it is completely dried by means of hot air, or to the dehydration presses, in which the water is replaced by alcohol. The dried or dehydrated nitrocellulose is then weighed out into rubber or rubber-lined bags, which are sent to the nitroglycerine hills to receive the measured quantity of nitroglycerine necessary to make a "paste" of the required composition. The paste is then treated with solvents, acetone or alcohol and ether, and worked up with mineral jelly in an incorporator, the whole mixture being kneaded into a uniform dough-like mass known as "cordite dough." This dough is then pressed through perforated plates in the form of continuous cords, from which the name of the finished material is derived. After being cut into suitable lengths the cords are freed from the solvent in solvent-recovery stoves, and finally blended and packed.

The ether manufactured at the plant is made by the action of sulphuric acid on alcohol. The efficiency of ether manufacture is deduced as follows:—Theoretically, 1 ton of ether ( $(\text{C}_2\text{H}_5)_2\text{O}$ ) requires 0.804 ton of alcohol ( $\text{C}_2\text{H}_5\text{OH}$ ). From the plant records is known the actual consumption of  $\text{C}_2\text{H}_5\text{OH}$  per ton of ether. Then 0.804 divided by this consumption gives the efficiency. The recovery of the solvent liquors is also an important factor in

connection with economy in solvent usage. The solvent recovery records give the amount of cordite sent to the stoves, the quantity and composition of the solvent used for this cordite, and the quantity and composition of the solvent liquors recovered.

#### Nitrocellulose Powder

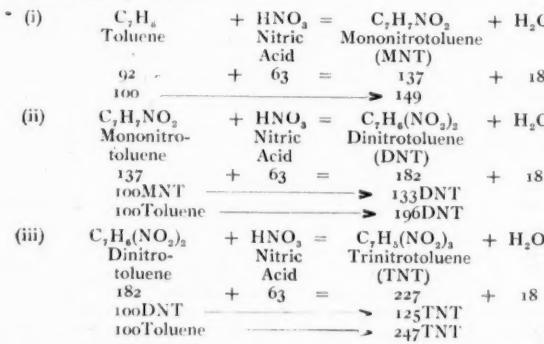
This explosive is prepared from nitrocellulose by gelatinisation with a solvent. The nitrocellulose is either dried in stoves or is dehydrated with alcohol, the dehydration process being the same as that used in the case of nitrocellulose for cordite manufacture. The dry material is then gelatinised by means of solvent, alcohol and ether being usually employed, and pressed through perforated plates in the form of a tape, which is cut into suitable lengths, freed from solvent in solvent-recovery stoves, and finally blended and packed. There are other propellant explosives in use, but these are, for the most part, very similar to the above, differing only in the composition of the nitrocellulose used, the methods of incorporation and gelatinisation, etc.

#### Toluene for Trinitrotoluene

The manufacture of high explosive differs from the manufacture of propellant explosive in that the nitration is carried out at moderately high temperatures, leading to the formation of waste acids of rather different composition and properties. The nitration of toluene to TNT is usually carried out in two or more stages.



According to the equation one molecule of toluene requires three molecules of nitric acid for complete nitration, three molecules of water being produced. Since the third nitro-group is difficult to introduce, a mixed acid of very low water content being necessary, it is obviously bad policy to attempt to complete nitration in one operation, as towards the end the acid, which is required to be at its greatest strength, will have been diluted with the water formed by the introduction of the first two nitro-groups. The reaction may be carried out in three stages, as illustrated in the following equations :—

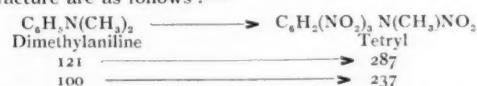


In practice it is usual to work first to MNT and then either to TNT directly in one operation, or in two operations through DNT. For economy of acid it is usual to make the trinitration or final stage of nitration with a very strong fresh mixed acid. The spent acid from this stage has comparatively little nitric acid available for further nitration, but the sulphuric acid is, of course, unchanged except by dilution with the water produced during the reaction, and can be re-used, after the addition of more nitric acid, as a medium for earlier nitrations instead of making up fresh acids for these; that is, the TNT spent acid fortified with nitric acid is used for the manufacture of DNT or MNT, or both as the case may be, thus avoiding the use of further large quantities of fresh acid. In addition, the TNT waste acid is generally dettoluted, that is, washed with fresh MNT, in order to utilise any nitric acid remaining in the acid, and also to dissolve any TNT which is in solution. Since the last or trinitration is carried out at relatively high temperatures, the TNT formed remains liquid and rises to the surface of the acid when the agitation is stopped after nitration is completed. The waste acid is run off from the bottom of the pan to be fortified, or to be sent to the waste acid treatment plant, whilst the liquid TNT, which follows the acid, is diverted to the washing plant, in which it is washed free from acid. The resulting TNT is then run into a drying

apparatus, in which it is freed from moisture, and is finally cooled to a solid state and packed. Perhaps one of the simplest processes for TNT manufacture is the method employed at Craigleath. In this process the waste acid from the final nitration is fortified with nitric acid and used directly for the nitration of toluene. The MNT so produced is dissolved in concentrated sulphuric acid and fresh mixed acid is then added. The waste acid from the MNT nitration is denitrated and concentrated in the usual way.

#### Dimethylaniline to Tetryl

This manufacture is carried out on a small scale only, since relatively small quantities of the explosive are required for use as a primer in high explosive shells. The nitration, which is extremely energetic, and is liable to lead to explosion, is carried out in enamelled-iron or lead pans, fitted with jackets through which cooling water can be circulated. Dimethylaniline is dissolved in a large excess of sulphuric acid, and the solution is added cautiously to excess of strong nitric acid contained in the nitrating vessel. The temperature is kept carefully under control by means of the water-jacket, and by adjusting the rate at which the sulphuric acid solution is allowed to flow into the nitrator. When the reaction is complete the solid tetryl separates from the acid. The whole mixture is cooled down and filtered to separate the tetryl from the waste acid. The latter is generally recovered, but may in some cases be run to waste. The tetryl, which holds up large quantities of acid even after filtration, is plunged a little at a time into a drowning bath of cold water. After this preliminary treatment the tetryl is boiled repeatedly with water to remove as much acid as possible, and is then freed from moisture in a wringing machine and dried. The dried material is usually refined before use. The numerical relations governing the manufacture are as follows :—



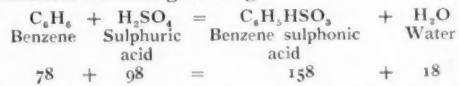
from which 100 parts of dimethylaniline should yield 237 parts of tetryl.

The tetryl produced in this way is used for various grades of explosive, but for most purposes a purer material is required and the crude tetryl has therefore to be refined. This is effected by a process of recrystallisation. Acetone was the solvent formerly used for this purpose, but more recently a process of recrystallisation from strong nitric acid has been introduced and is now being employed. A certain amount of material, both tetryl and solvent, is naturally lost in the process of recrystallisation, and the records for this part of the process are designed to show the amounts of material used, lost, and recovered.

#### Manufacture of Synthetic Phenol

The starting point for this manufacture is benzene ( $\text{C}_6\text{H}_6$ ), which is first converted into benzene sulphonic acid by the action of strong sulphuric acid. The sulphonation, as this operation is called, is carried out in cast-iron vessels provided with jackets for the regulation of the temperature, and fitted with stirring gear and reflux condensers. The acid used varies in strength from 93-94 per cent.  $\text{H}_2\text{SO}_4$ ; occasionally acid containing free  $\text{SO}_3$  may be used, but this is not desirable, as by-products may be formed. An excess of sulphuric acid must be used in any case, and this must be greater the lower the strength of acid used. Hence it is impossible to obtain the theoretical usage of sulphuric acid, and the product is a mixture of benzene sulphonic acid with unchanged sulphuric acid. For this reason the efficiency at this stage can only be checked by constant analysis of the product.

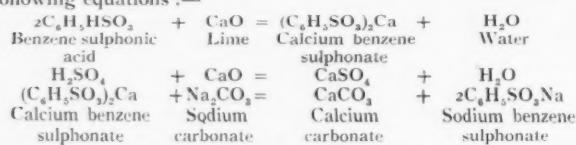
The numerical relations governing the reaction are as follows :—



from which one part of benzene should yield 2.026 parts of benzene sulphonic acid.

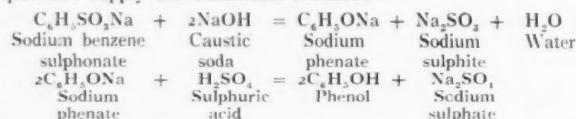
The next stage in the manufacture is the isolation of the sodium salt of the benzene sulphonic acid. The mixture from the sulphonation vessels is generally neutralised with lime in the presence of water and the solution of calcium benzene sulphonate filtered off from the relatively insoluble calcium sulphate. Treatment of the solution with sodium carbonate causes precipitation of insoluble calcium carbonate, yielding a solution of the sodium salt. This solution is concentrated to yield the solid salt, which is then dried. Many variations of this method have been em-

ployed, but in every case the final product at this stage is the sodium salt. The course of the reaction is indicated by the following equations:—



from which one part of benzene sulphonic acid should yield 1.139 parts of the sodium salt.

The next stage in the manufacture, known as the fusion stage, is effected by adding the sodium salt (usually called "sulpho salt") to an excess of caustic soda, maintained in the molten condition in a cast-iron vessel fitted with agitating gear. The reaction results in the formation of the sodium salt of phenol, which is transformed into crude phenol by running the molten mixture into dilute sulphuric acid solution. The following equations supply the numerical relations:—



from which one part of sulpho salt yields 0.522 part phenol. Excess of caustic soda must always be used, and as this is a very expensive material, the efficiency at this stage is most important. The records therefore show the quantities of sulpho salt, caustic soda, and acid used, and the amount and composition of the crude phenol produced.

The final stage consists in the distillation of the crude phenol to obtain the pure product, and the records here have only to show the amounts and compositions of the crude phenol used and the quantities of pure phenol produced. Adjustment has to be made for intermediate fractions, and this is most easily effected by taking complete stocks of all material on the distillation plant at the beginning and end of each period, and by adding any decrease, and subtracting any increase of stock from the quantity of raw material used, all quantities being expressed in terms of pure phenol.

#### Phenol to Picric Acid

The manufacture of picric acid from phenol is carried out in two separate stages:—

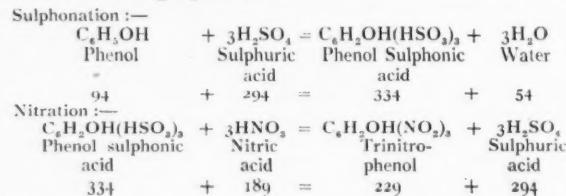
- (1) Sulphonation of the phenol by means of strong sulphuric acid.
- (2) Nitration of the phenol sulphonic acid so produced by means of nitric acid, or by means of a strong mixed acid.

The operation differs, therefore, from the nitration of the materials dealt with above, in that the organic material to be nitrated is first dissolved in sulphuric acid, the solution being then treated with nitric acid to effect replacement of the sulphonate group by the nitro group. The equations given below illustrate the chemistry of these two stages. A weighed quantity of phenol is dissolved in an excess of strong sulphuric acid in lead or iron pots fitted with agitators. In some processes sufficient sulphuric acid is used to keep the resulting substance in the fluid condition after cooling. In other cases it is preferred that the sulphonate solution should solidify on cooling, it being claimed that better yields are obtained under these conditions. In the older weak acid method the phenol sulphonic acid solution is treated in earthenware pots with nitric acid of about 70 per cent. strength, which is allowed to flow gradually into the pot during a period of several hours. The reaction is accompanied by liberation of great quantities of nitrous fumes, which are produced by reduction of nitric acid by the organic material. These fumes constitute a source of serious loss in the process unless adequate provision is made for their recovery in the form of nitric acid. When the reaction is complete the waste acid, which consists almost entirely of dilute sulphuric acid, is drawn off from the pots by means of syphons and is removed for subsequent treatment and concentration. The picric acid is then transferred from the pots, and after washing and grinding, is dried and packed in the ordinary way.

When the nitration is carried out by means of a strong mixed acid, the waste acid contains a certain amount of nitric acid. In

this case the waste acid must be treated at the denitrators, and it may be necessary to distil the weak nitric produced, if it cannot be absorbed for mixing purposes in the form of weak acid.

The numerical relations governing the reactions are obtained from the following equations:—



from which 94 parts of phenol require 189 parts of nitric acid, and yield 229 parts of picric acid, or 1 ton of picric acid requires 0.826 ton of  $\text{HNO}_3$  and 0.4105 ton of phenol.

#### Society of Public Analysts

THE ORDINARY MEETING was held at the Chemical Society's Rooms, Burlington House, on November 5, Dr. Samuel Rideal (president) in the chair.

Certificates were read for the first time in favour of Messrs. Percy Ewart Bowles, F.I.C., Ph.D. (Heidelberg), Charles Crowther, M.A. (Oxon), Ph.D. (Leipsic), John William Hawley, B.Sc. (Lond.), A.I.C., Ernest Joseph Lush, B.A. (Cantab), A.I.C., H. Percy Marks, B.Sc., A.I.C., and Robert Selby Morrell, M.A. (Cantab), Ph.D. (Wurtzburg), F.I.C. Certificates were read for the second time in favour of Messrs. John Dalton and William Norman Leng.

The following were elected members of the Society:—Messrs. John Haworth and Henry Turner Lea, M.Sc. (Birmingham), A.I.C.

Papers were read on "Egyptian Bricks," by G. Rudd Thompson, F.I.C.; on "The Analysis of Brazilian Zirconium Ore," by A. R. Powell and W. R. Schoeller, Ph.D.; and on "The Halogen Absorption of Turpentine," by Ethel M. Taylor.

The author of the paper on "Egyptian Bricks" has investigated the nature of some authentic specimens of sun-dried bricks from the neighbourhood of Pithom, one of the fortified cities of the Captivity, with a view of explaining the well-known expression "bricks without straw," and his results go to show that "straw" did not actually enter into their composition. He also compares the analysis of the mud of the river Nile, as shown by these bricks made some 3,000 years ago, with the same mud in 1912, when a remarkable similarity of composition is shown.

In the paper on "The Analysis of Brazilian Zirconium Ore," a detailed description of the analysis of the most important ore of zirconium was given. The finely ground material is fused with sodium carbonate, the melt extracted with water, and the insoluble portion fused with bisulphite. This treatment eliminates silica, and renders all the other constituents soluble. The solution is precipitated with sodium thiosulphate, and the ignited precipitate weighed as  $\text{ZrO}_2 + \text{TiO}_2 + \text{Al}_2\text{O}_3$ . Titania and alumina are determined in this precipitate, zirconia being obtained by difference. Iron, manganese, lime, and magnesia are determined in the filtrate from the thiosulphate precipitate.

The paper on "The Halogen Absorption of Turpentine" pointed out that, in contradistinction to Wijs solution, a solution of  $\text{IBr}_3$  in chloroform was found to give a distinct resting stage at a halogen absorption equal to  $4\text{Br}$  for  $\text{C}_{10}\text{H}_{16}$ . This stage was reached practically instantaneously by treating turpentine with a large excess of  $\text{IBr}_3$ , and titrating back at once; the secondary reactions leading to further absorption were sufficiently slow not to interfere with the much more rapid main reaction.

THE COUNCIL OF THE PHARMACEUTICAL SOCIETY of Great Britain, at its last meeting, heard read a letter from La National Pharmaceutique, Brussels, intimating that within a few days from the date of the communication (October 16) there would be forwarded a cheque for 10,000 fr. (£400 at pre-war rate) subscribed by Belgian chemists in token of their "deep gratitude to the English chemists for the generosity with which they have helped the Belgian chemists who suffered through the war." The gift, says the *Pharmaceutical Journal*, is allocated to the Benevolent Fund of the British Pharmaceutical Society.

## Chemistry in Gasworks, Shipyards, and Paint Works

### Duties and Problems of the Works Chemist

The first meeting under the auspices of the Technical Section of the Newcastle Chemical Industry Club was a great success, and the discussions which followed were of an interesting and lively character, not unmixed with a good deal of good-humoured banter by members of industries other than those to which the speakers belonged. Mr. O. Smalley presided over the gathering which was held on Wednesday evening, and the first paper was delivered by Mr. G. Weyman, M.Sc., of the Newcastle and Gateshead Gas Company, who spoke on the "Work and Problems of a Gas Chemist."

#### The Gas Chemist

In his paper on "The Work and Problems of the Gas Chemist," Mr. Weyman said that the chemist's work must be classified as follows, and the chemical staff conveniently divided into much the same sections:—Analytical; supervision of chemical plant; working trials; obtaining data for and introduction and working up of new and special processes; research, pure and applied; collecting, averaging and tabulating results.

Speaking of the supervision of the chemical plant, he said that since all the processes in a gas works were chemical in their nature, it was obvious that the chemist must play the most important part in their control, and be responsible for the methods of working and the results obtained. It was for him to reduce losses to a minimum, report daily as to efficiency, and make suggestions as to improvements. The foreman had to take his instructions from the chemist regarding all details of the method of working, but arranging for the necessary supply of labour and discipline lay with the general foreman or manager. The chemist included in his supervision all the analytical work necessary to keep a careful control and submit his daily figures to the chief chemist. Such supervising chemists were placed in charge of retort houses, condensers and scrubbers, purifiers, water, gas, sulphate, concentrated ammonia, benzol and boiler plants. His training tended to become specialised, and involved measurement of high temperatures, losses by radiation, conduction, diffusion, vapour pressures, and gas pressures, etc. In connection with working trials, he mentioned that that section included trials of new plants as well as special tests of established plants. Contractors often knew little enough about the working of plants they constructed, and might well be indebted to the works chemist for pulling them out of difficulty.

In referring to the work of obtaining data for, and the introduction and working up of new and special processes, Mr. Weyman said that section really came under the heading of applied research. Sometimes difficulties were not realised until a process was applied on a large scale—more often a small scale plant would supply an almost bewildering number of previously unrealised factors, and much time and trouble was wasted in neutralising effects which on a large scale corrected themselves. An example of the first type could be instanced in the "liming of coal" process. Addition of lime to coal had a very good effect on a small scale, but when applied on a large scale it had to be abandoned, owing to the slagging effect of the ash on the furnace linings. Of the latter type a model coal-testing plant of 1/1,000 tons capacity was a good example.

Dealing with pure and applied research, he indicated the enormous field, and said that little was known of coal or coke except that they both had their uses. We could not be satisfied with the state of our knowledge of combustion. It seemed to him that the advance of pure chemistry in the next period of years might well be due to the results of research work originating in observation of large scale operations, a method analytical in character. In connection with the work of collecting, averaging and tabulating results, he insisted that that work should not be neglected. It was essential in order that development might be an all-round process. For some years the records of the Chemical Department of the company he served had been made up to form an annual report, and he considered the work entailed had been saved many times by the ease with which reference could be made to results for which one had been responsible.

In the discussion which followed Mr. W. Jones asked whether cyanogen was recovered in the gas works.

Mr. Weyman: Not in Newcastle. The removal has been considered in order to minimise corrosion of steam ends.

Mr. O. Smalley said he had been interested to learn that gas chemists controlled to some extent the quality of metals in order to prevent corrosion. He would like to know what were the general types of corrosion. He had recently come across an alloy which consisted of 23 per cent. to 24 per cent. of zinc, 5 per cent. of nickel, 3 per cent. of lead, 4 per cent. of iron and the rest of copper, which resisted sulphuric acid in all strengths, hot or cold.

Mr. Weyman replied that the corrosion generally occurred by fittings being buried in the ground. In analysis few fittings contained anything like 5 per cent. of tin. He had found corrosion in window glass at the gas works.

In reply to Professor Bedson, Mr. Weyman said the question of nitrogen in coke was an interesting one, and he was of opinion that we knew no more about the constituents of coke than of coal.

Professor Bedson: Have you any views on the issues raised by Professor Bone on the gas industry? (Laughter.)

Mr. Weyman: Very strong views. We should have a discussion on the proposed standard of gas.

#### The Shipyard Chemist

Mr. C. L. Haddon, M.Sc., gave a short address on the work of a shipyard chemist. He pointed out that a chemist in a shipyard was in an exceptional position when compared with the ordinary industrial chemist. Other chemists actually made something, but the chemist in the shipyard made nothing at all; he only received things and assembled and analysed them. The materials bought by a shipyard buyer were innumerable, and the result was that the work of the chemist was extremely varied. The routine work of testing was a very big proposition. He instanced many of the things which they were called upon to do, such as determining the quality of air in workshops and oil tanks, analysing cement, submitting structural failures to chemical analysis, etc. He held the opinion that the Lloyd's test was not a sufficient test for constructional work, being a test which was based on mechanical stresses and strains brought to bear gradually upon the material employed. In rivets that was particularly noticeable. Many rivets which had failed to do their work properly were found to be failures owing to the content of phosphorus and sulphur in them. He gave examples of work going wrong, despite the fact that the materials used had easily passed the Lloyd's test. The variety of complaints from yard foremen as to the quality of oils, paints, etc., was a fruitful source of work for the shipyard chemist. One instance he gave in that connection was a complaint that the paint used on the short funnels of a certain type of submarine was of no use, being badly affected by the sudden plunging of the craft when the funnels were practically red hot. It was to the chemists that they came for advice on such matters. The question of corrosion was a particularly important one in the building of ships, and Mr. Haddon gave instances of how the chemist had often been able to deal with what often proved a very large factor in depreciation of tonnage. Summing up, he thought the nature of the work was so varied that it was quite impossible to lay down any hard and fast rules for the organisation of chemical work in a shipyard.

Professor Bedson remarked that it was very interesting to hear of the extent to which chemistry was now being employed in shipyards. He was glad that they had reached the fundamental view of the usefulness of the chemist. He thought the work in a shipyard must have a variety and charm which was absent in a chemical works turning out the same product.

Mr. Smalley said he was not inclined to agree that the failure of certain rivets mentioned by Mr. Haddon was entirely due to the sulphur content. He did not say that the chemical properties of material could be neglected, but it was not necessarily the only test.

Mr. Jones pointed out that a great number of theories which had held good for years on the chemical composition of steel had been upset in actual practice.

Mr. Haddon, in reply, asserted his belief that the Lloyd's tests, based on mechanical gradual stresses, were not sufficient, and ought, at least, to be supplemented by chemical tests.

#### The Paint Works Chemist

Mr. J. Y. Reed, in an address on the work of a paint chemist, said that it was only in comparatively recent years that the need of extensive research had been fully realised in the paint, colour and oil industry. America had, perhaps, shown us the way regarding paints, and just prior to the war, Germany had made rapid progress in the making of colours, both aniline dyes and finished colours, and also in the preparation of other materials for paint making. During the war, however, the colour chemists of this country had shown that they could meet all needs by investigating new sources of supply, and utilising fresh methods for obtaining results. A paint and colour works chemist, as a rule, arranged his work on the lines usually adopted in a works, getting stock and routine samples out of the way as early as possible, so leaving the latter part of the day for research work. This method of procedure, however, could not always be adhered to.

A paint works chemist regarded paint of any description under three heads, namely, pigment, medium, and thinners. Dealing with the first, Mr. Reed said that dry pigments for paint making were chiefly obtained from the following sources:—Natural or earth colours, such as oxide of iron, umbers and siennas, raw and burnt carbonin, various forms of vegetable and lamp blacks and graphite. All these had to be tested for colouring and strength when reduced with white lead or zinc oxide, and more than a trace of moisture was fatal to success in paint grinding. Matter soluble in oil or turpentine had also to be tested for specific gravity, which was an important point, as a too heavy pigment was not desirable.

Mr. Reed described the manufacture of white paint at some length. The materials employed had to be tested as to their behaviour with the mediums and thinners to be used in manufacture. Paint manufacturers who made their own white lead had an advantage in being better able to control the uniformity of the material. He held that a paint chemist required some knowledge of engineering. So much de-

pended on the physical side of the processes that some chemists specialised on dry colour making alone. The testing and analysis of dry colours required a full knowledge of the chemical physical qualities and analysis of most metals, owing to the variety of the requirements. The grinding medium afforded a great deal of work to the chemist, and in dealing with thinners nothing could be taken for granted. The chemist usually had the work of checking the drying of the finished product, arranging exposure tests under real conditions, and making records of the tests.

In conclusion, Mr. Reed said that a paint works chemist was of little real value if he confined his energies to turning out a few beautiful analyses per week. Accuracy in analysis was not enough, there was a need for highly cultivated powers of observation and a quick method of arriving at results without sacrificing thoroughness and accuracy.

In answer to several questions regarding German paint and colour practice, Mr. Reed said he was inclined to think that a great deal of the translated German writing on the subject was rubbish designed to act as a red herring to keep British workers off the real thing.

## The Society of Chemical Industry

### Manchester Section

#### Papers by T. Callan, J. A. R. Henderson, and R. Barton.

THERE was a large attendance of members of the Manchester Section of the Society of Chemical Industry at the second meeting of the session on Friday, November 7, at the Grand Hotel. Mr. John Allan, who presided, announced some communications to be given at forthcoming meetings, and mentioned that there are now 540 members of the section.

Messrs. T. Callan and J. A. Russell Henderson contributed a paper on "The Estimation of P-Phenylene Diamine," which is largely used in the colour and fur-dyeing industries. It could be rapidly and accurately estimated, the writers said, by adding the solution to be estimated to excess of an alkaline solution of sodium hypochlorite previously standardised against N/10 sodium arsenite, and titrating the unchanged hypochlorite against N/10 sodium arsenite. The p-phenylene diamine quantitatively removed available chlorine from the solution as benzoquinone dichloroimide, this substance under these conditions being inactive, so that the loss of available chlorine was proportional to the amount of p-phenylene diamine present. Naphthalene 1:4 diimine, as well as p-amido diphenylamine behaved similarly. It was added that in the case of the introduction of a sulphonate group into the molecule, which resulted in the formation of soluble chloroimides, the method of analysis failed.

In a paper on the estimation of sulphuric acid in presence of organic sulphonate acids, Messrs. T. Callan, J. A. Russell Henderson and R. Barton said the estimation was of considerable interest to those concerned with the analyses of intermediates used in the dye-stuff industry. The authors pointed out that many such intermediates contain sulphates or sulphuric acid derived from the excess of sulphuric acid used in the sulphonation of hydro-carbons such as benzene and naphthalene, &c., and their nitro-amino and hydroxy derivatives. There was in the voluminous literature relating to the determination of sulphuric acid no special reference which dealt with the effect of organic sulphonate acids; and as these substances might affect the determination in opposite directions, namely, by the contamination of precipitated barium sulphate by co-precipitated barium sulphonate and the possible solubility of barium sulphate in solutions of sulphonate acids, the methods usually employed had been examined from this point of view, with the result that neither of these factors had been found to exert a disturbing influence. The authors also described a modified volumetric method for the rapid determination of sulphuric acid.

### Yorkshire Section

#### Papers by Mr. Mackey and Mr. Wright

The first meeting of the Session was held on November 3rd, and Mr. Mackey (the chairman) gave an opening address on "The Origin and Growth of Expert Evidence."

It was pointed out that two methods were available for utilising scientific experts in legal cases. On the one hand there was the French or Continental System in which the experts acted as assessors or advisors to the judge; on the other hand, the English system in which expert knowledge was given in open court in the form of evidence, and as such was subject to cross examination. The author

showed that the adoption of these systems by the Continental Powers and by England respectively, followed naturally from the fundamental differences between Continental codified law and English case law. A good expert witness besides being thoroughly versed in his own science, must be conversant with the laws of evidence and the methods of legal procedure, and especially must be able to state his facts in non-technical language.

Mr. Harold Wright read a paper on "The Change of the Refractive Indices of Fixed Oils with Temperature," in which he put forward a method of calculating the refractive index of an oil at one temperature from a determination made at another temperature. A standard temperature of 40 deg. C. was recommended, and to calculate results to this standard the following formula was used:

$$N_{40} = (N - 1) \left\{ \frac{0.9696}{1 - 0.00076t} \right\} + 1$$

where N is the observed index at temperature t deg. C., and  $N_{40}$  is the index at 40 deg. C. required. The author quoted a number of instances where his calculated values agreed with those already recorded.

In the discussion which followed Mr. Richardson advocated a standard temperature of 50 deg. C. as a number of important fats containing stearin were not liquid at 40 deg. C.

### Edinburgh Section

#### Dr. D. S. Jerdan on "Catalysis"

At the first meeting of the new Session Dr. D. S. Jerdan, chairman of the Edinburgh and East of Scotland Section, read a paper on "Catalysis."

The paper dealt with the original recognition of catalytic action by Berzelius, and the general characteristics common to reaction of this class. The discovery of the organic catalysts or enzymes was described in greater detail, showing how they were eventually recognised by Moritz Traube to act in the same way as the inorganic catalysts. The principal manufacturing processes in which enzymes are made use of were discussed, special attention being paid to processes where the older empirical methods were giving place to methods based on the results of scientific investigation. The influence of enzymes in the tanning industry was referred to, and particularly the modern substitute for the old puering process. The relation of enzymes to the butter-making and cheese-making processes was discussed with special reference to the various classes of enzymes at work in the preparation and ripening of cheese.

Recent developments in the application of enzymes or of the bacteria and moulds producing them were described, among them the preparation of acetone by the action of ferment on starch, and the treatment of distilling waste as devised by Effront, and carried out at Nesle, in France, whereby large quantities of ammonia and organic acids are recovered from what was formerly an inconvenient waste product.

Lastly, the probable course of future developments in enzyme chemistry was briefly sketched, culminating in the possibility of the synthesis on the large scale of complex organic compounds by taking advantage of the reversibility of the catalytic processes induced by the enzymes, and in the synthesis of the enzymes themselves when their constitution has been fully investigated.

### European Phosphate Requirements

MR. C. G. MEMMINGER, a United States trade commissioner, estimates the needs of crude phosphate in the following countries in the current year to be as follows:

|                        | Tons.     |
|------------------------|-----------|
| France                 | 1,100,000 |
| Italy                  | 600,000   |
| England                | 400,000   |
| Spain                  | 200,000   |
| Belgium                | 100,000   |
| Netherlands            | 100,000   |
| Portugal               | 50,000    |
| Scandinavian countries | 40,000    |
| Switzerland            | 10,000    |
| Total                  | 2,600,000 |

### Tar Oils in Germany

PROFESSOR H. GROSSMANN, of Berlin, states that successful attempts have been made during the war to render Germany independent of foreign sources of substances hitherto derived from imported petroleum oil. Large quantities of "tar oils" have been obtained from coal. This oil is a portion of the anthracene oil which distills over between 300 deg. and 360 deg. C. Crude anthracene and phenanthrene are removed therefrom by cooling, crystallisation and filtration. The more easily vaporised constituents are removed from the filtered anthracene oil, which is once more cooled, and the last solid constituent precipitated. The oil so obtained serves for the preparation of various lubricating oils. By long-continued heating at a high temperature a very viscous oil is obtained which was much used during the war. The tar oils can be mixed with mineral oils, and can be used for the manufacture of lubricating greases.

## Treatment of Gasworks Residuals

**Address by Mr. W. A. Twine**

A LECTURE on the "Working up of Gasworks Residuals" was delivered on Thursday, November 6, at the University of Birmingham, by Mr. G. A. Twine, chemical plant superintendent at the Birmingham Gas Works. The lecture was under the auspices of the Workers' Educational Association; and Dr. E. W. Smith, chief chemist at the Birmingham Gas Works, presided. Mr. Twine stated that the area of the Birmingham Gas Works was 100 acres; it was the third largest in the country; and 3,000 tons of coal were carbonised daily. From 100 tons of coal the following were obtained approximately: coke, 70 tons; gas, 1,000,000 cubic feet; ammoniacal liquor, 7.8 tons; tar, 5.35 tons; and then from the gas, cyanogen 107 lb. and sulphur 950 lb.

### Romance of Coal Tar

The Birmingham works, Mr. Twine said, were thoroughly up to date, the principal plant including the latest vertical retorts, tar extractors, ammonia scrubbers, cyanogen extractors, oxide purifiers, ammoniacal liquid wells, tar wells, ammonia stills, sulphate plant, and vitriol works. Mr. Twine spoke of the triumphs of the chemist, revealing the romance of coal tar and showing how our gas works aid industry. He pointed out that dehydrated tar from the tar stills was largely used all over the country for tar-spraying the roads, and in Birmingham this year 300 miles of roads had been so treated, and the area would be materially increased next year. This tar-spraying and the manufacture of tar macadam was revolutionising the road problem created by the vast extension of the motor industry and swift road transit. The other prosaic residual of the tar—pitch—was used for making briquettes from coal dust and entered largely into the manufacture of varnishes, blacks and also again into road work. These might be termed, said Mr. Twine, the bottom end of the long range to which tar was applied by science and industry; but these were commonplace compared with the marvels which were revealed at the other end of the scale.

The heat treatment of tar in stills yielded, as primary products, light, middle and heavy oils. From the light oils (at 170° C.) were obtained benzol, which was a source of power for the motor industry, and solvent naphtha, indispensable for the carrying on of the rubber industry. Naphthalene, for use in dye manufacture, was obtained from the middle oils, at 170° to 230° C., and carbolic acid for disinfectants and picric acid and salicylic acid.

In the production of dyes we had advanced tremendously in the world's markets since 1914; British dyes showed steady and consistent improvement, and were more permanent than formerly. This advance was due to the brains, energy and resourcefulness of our industrial chemists and dyers. The heavy oils gave off at from 230° to 270° C. creosote, which was of great value in the pickling of timber; and from the anthracene oil, at 270° to 400° C. anthracene, which was also of great utility in dye manufacture was obtained.

### Sulphate of Ammonia

The ammonium residual had been effectively utilised by the chemist. Sulphate was of great value in agriculture and the cropping results obtained by the small farmers of Belgium emphasised its fertilising properties. Other primary products were ammonia sulphide, used in salt works; ammon. hydrate, of value in salt and soda works; and in wool and cotton washing; ammon. chloride, which was very effective in galvanising and in cotton printing; ammon. carbonate, which was used in the manufacture of biscuits, &c.; and ammon. nitrate, used in the manufacture of explosives. During the war there had been a huge output from the Birmingham works of benzol and toluol. The multi-form combinations and variations of ammonia were bewildering, and Mr. Twine pointed out that the ice slab in the summer time reminded one of the utilisation of ammonia in the working of refrigerators. The use of disinfectants (obtained from carbolic acid) proved of incalculable value in the Near East theatre of war.

Mr. Twine illustrated his lecture with photographs and samples of the various things made from coal tar. These included a variety of synthetic scents and perfumes.



## Nitrogen Products and Carbide

### Cyanamide and Haber Processes Contrasted

At the fifth annual general meeting of the Nitrogen Products and Carbide Co. Ltd., in London on Tuesday, Major C. H. Campbell (chairman), in a comprehensive review of the Company's operations during the year, stated that the profit amounted to £118,814 os. 6d., which, together with £24,049 2s. 9d. brought forward, gave a total of £142,863 3s. 3d. A dividend of 9 per cent. had been paid in respect of the period of 18 months, £10,000 had been transferred to the reserve for contingencies (now standing at nearly £110,000), and the balance of £14,396 7s. 1d. it was proposed should be carried forward.

With regard to the undertaking and business at Vilvorde, which town was occupied by the Germans in the early days of the war, a claim against the German Government, he said, has been lodged with the Foreign Claims Office. We may hope that in the near future this claim, together with others due to our affiliated company, Nitrogen Fertilisers, Ltd., may be liquidated. The total amount of these claims is over £270,000. The right to use, in France, our catalytic process for the production of nitric acid, has brought in over £55,000 by way of royalties and, although the quantity manufactured will naturally diminish now that hostilities have ceased, the licence still has value, inasmuch as it provides for payment of royalties on a minimum tonnage within the next seven years.

### Production of Ammonium Nitrate at Dagenham

A considerable loss was incurred during the period in operating our Dagenham works. These works were employed on the production, by our catalytic process, of ammonium nitrate for our Government. The plant there had been specially designed to produce ammonia from cyanamide, which we manufacture at our works in Norway. In the early period of working we were able to procure cyanamide from Norway, but the submarine situation became so acute that it was finally impossible to obtain adequate supplies, and the only alternative was to use the ammoniacal liquor from gasworks. When our difficulties in this connection were explained to the Government authorities they treated the matter in a very unsympathetic manner. We were told that our product, owing to its high degree of purity, was much in demand, and that we must comply with the terms of our contract, failing which our works would be commandeered, and if we could not obtain supplies of cyanamide we must make arrangements with such gasworks as the Government had not, at that time, brought under their control. You are aware that the Government were experimenting with a view to establishing a National Factory at Billington-on-Tees, so, faced with the prospect of the works and the secrets of our manufacture passing out of the company's control, every effort was made to obtain supplies of ammoniacal liquor but without any great measure of success. After considerable difficulty, the Government arranged to place controlled supplies of ammoniacal liquor at our disposal, but at a price which was much greater than the equivalent ammonia in cyanamide upon which our contract had been based. Moreover, the use of ammoniacal liquor, the greater part of which was impure, entailed endless difficulties in treatment and large extra expense.

Our process was also brought to the notice of the French authorities, who at once realised the importance of becoming entirely independent of seaborne raw materials, and, after a close investigation by the French Government of all the known systems of fixation of atmospheric nitrogen, arrangements were made for the use of our process. The French Government undertook to build and operate a large factory at Angoulême to our designs and under our supervision, and this work was commenced in September, 1915. In September, 1916, the first units of plant were in successful operation, but, before this date, the Government had already voted a sum of approximately £15,000,000 for the establishment of cyanamide, nitric acid, and nitrate works in other parts of France, paying us a royalty on all acid manufactured. During the period of the war the experience obtained in the operation of the process on a large scale has been extremely valuable, and has led to the development of numerous improvements.

### The Haber Process

In the past few months a great deal has been written as to the merits of the Haber process for the fixation of atmospheric nitrogen in the form of ammonia, but it is evident that a great deal of misunderstanding exists as to the possibilities of this process as compared with the cyanamide method. It is common knowledge that the Haber process was extensively employed in Germany during the war, but according to reliable information, its use is not likely to extend far beyond the district in which it has been developed. Although extremely ingenious, it involves a vast number of operations and intricate processes, besides the employment of very expensive and complicated plant and technical skill of the highest order. According to a recent statement the Germans admit that successful operation depends upon the special skill which they alone have acquired. The intricate nature of the process is perhaps better illustrated by their own words when agreeing to the French Commission visiting the works of Badische Aniline, namely:—"If they (the French) saw the works, they would not be able to duplicate them, and, even when erected, they could not operate them." Moreover, it is a process which is entirely dependent upon coal, and, as such, comes directly under the influence of the high prices now ruling.

As holders of all the shares in Nitrogen Fertilisers, Ltd., we were the owners of the bulk of the shares in Alby Carbidefabriks, Sweden. During the period under review an offer was made to Nitrogen Fertilisers for their shares in that Swedish company, and, after submitting the matter to the Foreign Office for approval, your directors decided to accept the offer. The price obtained resulted in the substantial profit of over £345,000 accruing to Nitrogen Fertilisers on this investment. This transaction has enabled that company to pay off the whole of both the First and Second Debentures on the cyanamide factory, and thus entirely free it from encumbrance.

### Properties in Norway

It is the intention of the company to concentrate its energies on the development in Norway of such processes as require no coal, or, where this is indispensable, so to perfect the process that the coal required is cut down to a minimum. In this connection, it is hoped that researches now in progress will result in large economies being effected in the manufacture of calcium carbide and cyanamide. It is also intended to utilise our water-power for the treatment of minerals containing phosphorus for the production of a fertiliser which will combine the necessary nitrogenous and phosphoric matter in a form readily assimilable by plant life. Our researches have shown that it is possible, with cheap power, to produce nitrate of soda without recourse to any imported raw material. In view of the fact that even natural Chile nitrate requires the use of considerable quantities of coal, both for its preparation at the mines and for transport overseas, this process, if developed successfully, should have a very great future.

### Demand for Nitrolim

After pointing out the great need of artificial fertilisers to increase food production not only in this country, but throughout the Colonies, the chairman added:—“It is highly satisfactory to realise that we are manufacturing a product that is, and must continue to be, in great demand, for, not only is nitrolim now widely recognised as of the highest efficiency as a fertiliser, but its special characteristics render it particularly desirable at the present time. The fact that it supplies, in addition to nitrogen, so large a proportion of free lime is a great asset in its favour, for the value of lime and the need for liming the soil are points that are being constantly urged by all agricultural advisers, particularly as, during the last five years, large quantities of acid or acid-forming fertilisers have been employed to the serious detriment of the natural lime in the soil. The popularity that nitrolim was rapidly gaining up to the spring of 1916, when we had to divert it to the manufacture of explosives, is a sufficient assurance as to the possibilities that are before us in this direction. It only remains for me to say we consider we have gone through the bad times due to the transition from war to peace, and the market position of our products looks exceptionally bright.”

### Import of German Dyestuffs

#### Distribution of First Consignment

THE Board of Trade desire to notify consumers of dyestuffs that the first instalment of colours which are being obtained from Germany under the Reparation Clauses in the Peace Treaty will shortly be received, and will be followed at intervals by further quantities.

It is proposed that distribution should be effected as soon as possible after the arrival of each consignment. For the purpose of making this distribution, the information already supplied by the Colour Users' Association and the National Federation of Paint, Colour and Varnish Manufacturers as to the probable requirements of their members for dyestuffs during the next six months, will be utilised as a basis. In order that this information may be extended, so as to cover the whole of the requirements of the Colour Using Industry of the United Kingdom it is desirable that any actual consumer of colour who is not a member of the Colour Users' Association or the National Federation of Paint, Colour and Varnish Manufacturers, and consequently has not submitted any return to either of those bodies, should immediately forward to the Board of Trade, Industries and Manufactures' Department, Great George Street, S.W.1, information on the following points, namely:—

(a) The quantity of each particular brand of dyestuff estimated to be required during the next six months, and which is not likely to be available in sufficient quantity from either British, Allied, or Neutral sources of supply.

(b) The approximate consumption during the year 1913, of each of these colours.

Note.—The dyestuffs required should, as far as possible, be classified under the following headings:—Direct Cotton Colours, Union Colours, Acid Wool Colours, Chrome and Mordant Colours, Basic Colours, Sulphide Colours, Vat Colours, Oil Spirit and Wax Colours, Intermediate Products, and the names given should be the usual trade denominations so as to render them easily identifiable.

As it is probable that the quantities which will become available under these arrangements will not be adequate to meet the whole of the requirements of consumers, the Trade and Licensing Sub-Committee will be prepared to consider applications from actual consumers for additional quantities not coming under the Reparation arrangements, it being understood that any permission granted for the import of such additional quantities will be on condition that any arrangements for the purchase and import will be made by the Central Importing Agency in accordance with the notice in the Board of Trade Journal of June 26th 1919.

#### Import and Export Licences

The Board of Trade announce that Export Licence Department has now removed from 1, Queen Anne's Gate Buildings, S.W.1, and has been amalgamated with the Department of Import Restrictions at 22, Carlisle Place, S.W.1. The combined Department will be under the charge of the Assistant Secretary, Industries and Manufactures' Department, Board of Trade.

Applications for licences in respect of all commodities (with the exceptions stated below), and all enquiries relating thereto, should be addressed to the Director, Imports and Exports Licensing Section, Board of Trade, 22, Carlisle Place, S.W.1. (T.N. 4173 Victoria.)

Applications for licences for the *import* of dyestuffs, should be addressed as hitherto to the Secretary, Trade and Licensing Sub-Committee, Danloe Buildings, Spring Gardens, Manchester; and for licences for the *export* of coal, to the Controller, Coal Mines Department, Holborn Viaduct Hotel, E.C.1.

### Edinburgh a Chemical Centre

DISCUSSING the suitability of Edinburgh as a centre for chemical manufacture, Dr. A. C. Cumming stated, in a lecture at Edinburgh University last week, that many chemical manufactures could be carried on without affecting the amenity of the town, and that Edinburgh already possessed considerable local chemical manufactures. In a review of the cost of gas, electricity, water and rates in eight large towns of Scotland and England he said Edinburgh's position was not as favourable as would be expected from its position in the near neighbourhood of coalfields. There was little local market for chemicals other than fertilisers, and with regard to other manufactures Edinburgh must compete on level terms with other towns. There was a difficulty in finding sites within the boundaries of the city, on account of the manner in which factory and residential districts were intermingled. The greatest advantages were undoubtedly the near neighbourhood of coal and the seaport of Leith, which provided a way to the world's markets. The local water supply was suitable for chemical work, and cooling water could in general be obtained cheaply. An important point for a chemical manufacturer was the possibility of getting all kinds of chemical plant made and repaired locally; the facilities for such work were surprisingly good in Edinburgh.

Dr. Cumming concluded that it was not possible to assign any clear advantage to Edinburgh over many other places. If she were to share in the great developments and extensions which were recurring in the chemical industries, it must come from initiative and efficiency, rather than from any local advantages. Efficiency was a product of brains and education, and both should be obtainable locally. There was a natural caution about a Scotsman which inclined him to let another try a new thing first, with the conviction that he could do it better afterwards. A strong argument against such a policy was that chemical industries were nearly all located where they were started. The University, by providing special training in technical chemistry, hoped to turn out men qualified to help in the development of local chemical industries; but the co-operation of the commercial world was essential, if the scheme were to achieve its fullest possible success.

### Bradford Dyers and Colourists

#### Lecture by Professor Midgley

A LECTURE on “The Influence of Dyeing and Finishing on Woven Fabrics,” was given by Professor E. Midgley, of Bradford Technical College, at a meeting of the Bradford Society of Dyers and Colourists, on Thursday, November 6.

Professor Midgley said that no section of the textile industry offered such opportunities for original research and experiment as did the dyeing and finishing section, and there appeared to be a great opportunity now for the further application of chemical methods in cloth finishing, with a view to obtaining improved handle, appearance, firmness, and permanency of finish, in addition to providing fabrics with new properties. Referring to defects in fabrics, Professor Midgley said that he considered the standard of perfection was higher twenty years ago than at the outbreak of the war.

Defects developed during the dyeing and finishing processes were most difficult to trace to their source, and consequently it was not an easy matter to fix the responsibility. A serious irregularity in these processes was that known as “crimps,” which, to a large extent, was due to the artificial conditioning of yarn, because the outer layers of yarn on a spool received all the moisture applied, with the result that a mechanical and, in some cases, a chemical alteration took place in the portion of the yarn affected. The extent of the chemical alteration varied according to the kind of oil or emulsion, or both, applied to the material during spinning. Imperfections in the early stages of manufacture, reduced output during weaving, and created dissatisfaction on the part of the weaver. If quantity and quality of production were to be enhanced it was necessary that things should be better done than before.

#### Recent Wills

|  |         |
|--|---------|
| MR. C. HILL, oil extractor, Dewsbury .. .. ..  | 19,928  |
| MR. HARTLEY SMITH, of Guiseley, oil merchant .. .. ..  | 16,707  |
| MR. B. HEWORTH of Kidderminster, and of Springfield, Hightown, Liversedge, Yorks, head of the firm of Messrs. Hepworth & Co., Ltd., dyeware chemical manufacturers of Liversedge (net personality, £13,669) .. .. .. | 17,839. |

## From Week to Week

DR. TEED, the City analyst, states that adulteration is increasing in London.

IN THE HOUSE OF LORDS on Wednesday the Patents and Designs Bill and the Trade Marks Bill were each read a second time.

LIEUT.-COL. W. A. WAYLAND, chemical manufacturer, has been re-elected Mayor of Deptford for the sixth year in succession.

DYE WORKS AT GOUDA, near Rotterdam, have been entirely destroyed by the explosion of a boiler.

MR. FREDERICK MILLS has been elected chairman of the Ebbw Vale Steel, Iron and Coal Co., and not Mr. Frederick Mills Harling as stated in our last issue.

AT THE RECENT annual meeting of the American Zinc Institute it was decided to set aside \$25,000 for research and for a campaign advertising new uses of zinc.

MR. JOHN CADGE, of Walcott Hall, Norfolk, formerly a partner in the firm of Costling & Co., agricultural chemists, of Diss, has been killed by being thrown from a trap on to an iron gate.

THE BOARD OF TRADE acting on behalf of the Lords Commissioners of the Treasury, have granted a general licence under Defence of the Realm Regulation 30 F., permitting issues of capital for which a licence from the Treasury is required under that Regulation.

MR. HUGH GRIFFITHS, B.Sc., 15, New Bridge Street, E.C. 4, has been elected to represent the British Chemical Trades Association on the Aircraft Sub-Committee on Chemicals of the British Engineering Standards Association.

AN INTERESTING SURVEY of the general position of chemical industries in the chief countries of the world, and especially in France, is contributed by M. René P. Duchemin to the *Revue Scientifique* for October 4.

DR. A. W. CROSSLEY, Professor of Chemistry, at King's College, London, and at one time professor of chemistry and practical research in the laboratory of the Pharmaceutical Society, has been appointed Director of Research by the British Cotton Industry Research Association.

A METAL that can be substituted for platinum or gold in acid tests is announced by Professor S. W. Parr, University of Illinois, Department of Chemistry. He has named it Illium and estimates the cost at 25 cents an ounce. The new metal, it is said, can be machined like platinum. It is an alloy.

THE OUTPUT of sulphur in Japan diminished considerably in 1918 owing to the sudden cessation of demand subsequent on the conclusion of the armistice; the total production for that year was 64,711 tons, valued at yen 2,532,425, representing a decrease of 43.2 per cent. in weight and 46.9 per cent. in value compared with 1917.

ACCORDING TO *Stubbs' Weekly Gazette*, the failures in the United Kingdom for the week ended November 8 were 20, a decrease of two. The numbers of bills of sale registered and re-registered was 96, an increase of 33. Mortgages and charges registered by limited companies amounted to £1,813,378, the amount authorised (where stated) being £1,807,76.

AT THE CENTRAL CRIMINAL COURT on Friday before the Common Serjeant, the trial was concluded of Albert Evan Whatcott (29), metal worker, on a charge of stealing 40 tons of lead, the property of the Ministry of Munitions. The jury found the defendant guilty, and the Common Serjeant sentenced him to twelve months' imprisonment in the second division.

AN ACCIDENT OCCURRED at the works of Messrs. Wood & Bedford, manufacturing chemists, of Kirkstall Road, Leeds, last week, in which one youth was killed and another injured. They were being hauled up to a higher floor, it is stated, having got hold of a hook swinging from a crane. When they were a good distance from the ground, they both lost their hold and fell. At the inquest, only evidence of identification was taken, and the inquiry was adjourned.

UNDER AN AGREEMENT of the Chemical Employers' Federation and the trades unions, an award has been made under which, from December, all chemical shiftmen and day workers will receive increased wages of 10d. per shift or day. This represents 7s. 6d. and 5s. 7d. per week increase. Chemical engineering workers are advanced 5s. weekly. These advances entail £100,000 per annum on Messrs. Brunner, Mond & Co. alone.

DR. CHARLES H. HERTY, editor of *The Journal of Industrial and Engineering Chemistry* (New York), sailed for Europe on September 3, having been appointed by President Wilson to secure for the American dye consuming industry a six months' supply of vat dyes from the stocks now held by the Reparations Commission, under the terms of the Peace Treaty. It is expected that before the expiration of the six months period American producers of vat dyes will be ready to supply the needs of the consumers.

SIR RICHARD REDMAYNE has relinquished the temporary position which he accepted in 1917 as Director of Production and Technical Adviser to the Controller of Coal Mines, and has resumed his permanent duties as Chief Inspector of Mines at the Home Office. He has, however, consented, with the approval of the Home Secretary, to place his services, in an advisory capacity, at the disposal of the Controller of Coal Mines with regard to pending legislation affecting the coal mining industry.

PROFESSOR HAZELDINE AND PROFESSOR W. J. POPE have been appointed representatives of the Cambridge University at the inaugura-

tion of the University of Strasburg, to be held this month. The Council of the Senate, whilst putting forward a grace for the appointment of a syndicate to consider the allocation and the administration of the benefaction of the British Oil Companies, recommend, after consultation with Sir W. J. Pope, that in the interests of the Department of Chemistry, steps should be taken at once to establish a Professorship of Physical Chemistry. The stipend suggested is £1,000.

IT IS ANNOUNCED that the German dynamite or powder group has decided to double the share capital of each of the constituent companies. The Cologne-Rottweil Company will go up to 60,000,000 marks, the Rhenish-Westphalian Explosives Company to 26,000,000, the Siegen Dynamite Works to 1,200,000, and the former Nobel Company, of Hamburg, to 72,000,000. It is explained that the additional capital is required to permit of the completion of the programme of reconstruction, which is already in progress, and the acquisition of works which are necessary for the development of the undertakings.

ACCORDING TO REPORTS for the first six months of 1919 received by the United States Geological Survey from nearly 300 correspondents who were operators or owners of chrome mines in 1918, chrome mining in the United States has nearly ceased. From January 1, 1919, about 1,400 tons of chrome ore were mined and shipped from three mines—two in San Luis, Obispo Co., California, and one in Wyoming. In addition, 300 tons of chrome ore mined in 1918 were marketed during that period. The two mines in California appear to have been closed down, at least for the present, so that the one in Wyoming is the only active producer of domestic chrome ore.

THE U.S. WAR TRADE BOARD SECTION has decided to permit the importation of vat dyes from Germany in quantities sufficient to supply the requirements of the consumers of the United States for the six months' period October 1, 1919, to April 1, 1920. Importations of these articles will be governed by regulations to be announced as soon as the necessary details have been completed. In the meantime, users of vat dyes have been requested to file with the War Trade Board Section applications giving their estimates of the amounts of vat dyes which will be required for consumption in their plants during the above-mentioned period.

THE INACTIVITY OF THE RUSSIAN platinum mines has caused a corresponding increase in activity in Colombia. A large company has recently been formed to operate in Colombia, which is reported to hold 10,000 acres of land as well as 50 miles of river bottom. The operations of this company should materially increase the output of platinum from Colombia. A substitute for platinum in electrical apparatus has been the object of some private investigations. One satisfactory substitute for cathodes, it is stated, was found to be 90 per cent. gold and 10 per cent. copper. The same alloy was found suitable as an anode after being electrically coated with a thin layer of platinum and then carefully polished and burnished.

## Obituary

DR. H. C. GREENWOOD.—The death occurred at Winnington, on November 4, in his thirty-second year, of Dr. Harold Cecil Greenwood, O.B.E., D.Sc., F.I.C. Born on May 3, 1887, he was a Mercer Scholar of Manchester University and took his B.Sc. (first-class honours) in 1907. After publishing researches on the temperature of reduction of refractory oxides by carbon, and on the production of ferro-alloys, he obtained his M.Sc. and a Beyer Fellowship. In 1909 his research on the boiling points of metals was published, and he subsequently worked with Professor Haber at Carlsruhe on the synthetic production of ammonia; the results of this research, however, not being published until 1915. After further work on the specific and latent heats of aluminium and zinc, carried out at the National Physical Laboratory, he obtained his D.Sc. (Victoria) in 1912. From 1911 to 1915 he was research chemist to Messrs. William Hutton & Sons, Sheffield, and published papers on the de-carburisation of steel and on electrical resistance furnaces. In 1915, he received a commission in the R.N.V.R. After a year's work on the manufacture of hydrogen for the Admiralty, he was transferred to the Munitions Inventions Department. Here he was in charge of research work on the synthesis of ammonia, and was engaged on it up to the time of his death. This work is of great national importance, and he will be sadly missed by his colleagues in the developments which are now taking place. In 1918, he was elected a Fellow of the Institute of Chemistry. He was on the committee of the Chemical Engineering Group of the Society of Chemical Industry; and was the author of a text-book on "Industrial Gases," which is in course of publication. A quiet and genial personality, he won the esteem of all who worked with him. A strenuous worker and a brilliant experimenter, he leaves behind him a record of work and success such as falls to the lot of few men to achieve so early in life. By his death, the profession of chemistry suffers a real loss.

MR. S. WILLIAMS.—Mr. Samuel Williams, a co-founder of the Pontardulais Chemical Works, a founder of the Dulais Tinplate Works, and a director of Joseph Bevan & Sons' Chemical Works, died at Pontardulais on Saturday, November 8, in his eighty-fourth year. Mr. Williams was also connected with the Grovesend Steel and Tinplate Co., and took an active part in public life.

## Chemical Matters in Parliament

### Sheffield Steel-testing Laboratory

Mr. Kellaway, in reply to Mr. Neal (House of Commons, November 6), stated that premises at Townhead Street, Sheffield, were taken over in December, 1917, at an annual rental of £500, for use as a metallurgical laboratory. During the past year all other temporary metallurgical laboratories, established during the war in various parts of the country, have been closed down. A laboratory, for the testing of steel and other metals for artillery equipment and aircraft, would be required so long as stores of this nature were supplied to the War Office, the Air Ministry, and other Departments. The future annual cost was estimated at £6,100, and it was expected that an approximately equivalent sum would be recovered from contractors.

### Derbyshire Oil Borings

Mr. Kellaway in reply to Sir Arthur Fell (House of Commons, November 10), stated that progress in the Derbyshire boring operations had recently been somewhat delayed by unavoidable accidents and difficulties in getting material. The boring at Hardstoft was still flowing at the rate of about 260 gallons a day, and the oil was being put into storage on the spot. There were about 36,500 gallons in stock. No further tests as to the quality of the oil had been made, but there was no reason to suppose that there had recently been any appreciable change in its character.

### Dye Manufacturers' Subsidy

In reply to Major McKenzie Wood (House of Commons, November 10), who asked the President of the Board of Trade whether he were aware that the subsidised dye manufacturers were supplying to woollen manufacturers dyes which were not fast to milling, and that in consequence quantities of good material were being spoiled weekly; and whether he would take steps to enable woollen manufacturers to obtain dyes that could be guaranteed, Sir A. Geddes stated that if dye users could not obtain dyestuffs of suitable kind or quality from domestic sources it was open to them to apply for licence to import.

### Soap Prices

In reply to Major Barnes, who asked the President of the Board of Trade (House of Commons, November 11), whether, in view of the great increase in the price of soap since the Armistice and the fact that recent purchases of soap manufacturing companies had brought the manufacture of soap in this country almost entirely under one control, that of Messrs. Lever, Ltd., he would appoint a Committee to inquire into the exercise of that control and report as to the desirability of the State taking any action towards the regulation of the price of this essential commodity? Mr. Bridgeman stated that a sub-committee of the Central Committee had already been established under the Profiteering Act, and was at present engaged in investigating and inquiring into the manufacture of soap.

### Electro Bleach and By-Products

Mr. W. Thorne asked the Minister of Transport (House of Commons, November 12), if he were aware that Electro Bleach and By-Products, Ltd., of Middlewich, Cheshire, were suffering serious inconvenience owing to a shortage of rolling stock in which to dispatch their products; that this had been going on and getting worse during the past few weeks so much so that in all probability, unless immediate relief were obtained, the plants would have to shut down, with the obvious result that many workers would become unemployed; and if he intended taking any action in the matter.

Sir Rhys Williams, Parliamentary Secretary: A complaint was received from the Electro Bleach and By-Products, Ltd., of Middlewich, on October 16, and after full inquiry, I have no reason to think that they have not been receiving their due proportion of the wagons available. In view of the present shortage of empty wagons, care must be taken that all traders get a fair share of the wagons available and that no trader receives undue preference.

### Picric Acid Fumes

THE Official Referee (Mr. Edward Pollock) continued in the Civil Court at the Leeds Town Hall, on Wednesday, the hearing of the arbitration case between Richard Kershaw and Sarah E. Young, executors and trustees of the late Mr. Richard Kershaw, Crow Nest, Lightcliffe, near Halifax, and Messrs. Brooke's Chemicals, Ltd. The former claimed damages amounting to £13,400 in respect of the alleged permanent depreciation of the Crow Nest estate owing to fumes and effluent emitted from the defendants' picric acid works in the vicinity.

William Arthur Smith, who was farm bailiff at Crow Nest until September, 1917, stated that the fumes were so bad and offensive that he had to keep the doors and windows closed. Brass and silver were turned black, and the trees on the estate were affected. Grass was burned up, and there were several bare patches. Forty-eight head of cattle did so badly that they were not pastured in 1917.

Harold E. Wellox, a forester, employed at Stockeld Park, who had made an examination of the estate, said that on the side nearest to the works many of the trees were practically leafless, and gave the appearance of late autumn.

The hearing was again adjourned.

## Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 4, Queen Anne's Gate Buildings, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

|                                       |   |       |
|---------------------------------------|---|-------|
| Johannesburg ..                       | Tar or tar substitute (Jan. 7, '19). Specifications, &c., may be consulted by British firms interested at the Enquiry Room of the Department of Overseas Trade (Development and Intelligence), 73, Basinghall Street, London, E.C. 2. | 553   |
| France ..                             | Manures, Fertilisers, &c. . . . .   | 999   |
| Sweden (Gothenburg)                   | Chemicals . . . . .   | 1,014 |
| Brazil ..                             | Chemicals, cement . . . . .   |       |
| Melun ..                              | Chemical products; pharmaceutical products; drugs, &c. . . . .  | 1,045 |
| Canada (Montreal)                     | Oils; chemicals and drugs. . . . .  |       |
| Sydney ..                             | Chemicals; drugs; oilmen's stores . . . . .   | 1,024 |
| Sweden (Gothenburg, Stockholm, Malmö) | Chemicals . . . . .   | 1,055 |

## Contracts Open

FUEL OIL (400 tons of light American fuel oil, suitable for Diesel engines).—For the Dundalk Urban Council. Tenders to Mr. P. A. Spalding, Electricity Works, Dundalk, by 6 p.m., November 19.

GAS OIL.—For the Shrewsbury Gas Light Co. Tenders to Mr. C. M. D. Belton.

MOTOR SPIRIT.—For the Commissioners of H.M. Works. Particulars from Controller of Supplies, H.M. Office of Works, King Charles Street, Westminster, S.W. Tenders by 11 a.m., November 21.

COD LIVER OIL.—For the Nottingham Education Committee. Particulars from the School Medical Officer, 36, Clarendon Street. Tenders by November 19.

STORES AND MATERIALS.—(a) cement; (b) blue lias lime; (g) disinfectants; (r) refined tar; (s) pitch; (t) creosote oil. Particulars from Mr. A. Brown, city engineer, Guildhall, Nottingham. Tenders by November 27.

RAILWAY STORES.—(6) oil, &c.; (10) colours (dry and ground); (13) drysalter; (16) glass (plate and sheet); (17) glass (sundry); (33) soap. Particulars from Mr. T. Thomas, Stores Superintendent, Stoke-on-Trent. Tenders by 10 a.m., November 24.

### Board of Trade's New Offices

THE President, Parliamentary Secretary, Permanent Secretaries and the staffs of the following Departments are now installed in their new offices, in Great George Street: Commercial Relations and Treaties; Industries and Manufactures; Power Transport and Economic; Marine; Secretariat of the Board of Trade Council; *Board of Trade Journal* and establishment. The Public Utilities and Harbour Department, Legal Department and Library are still housed at 7, Whitehall Gardens, but it is hoped to remove them to the new offices in the course of the next week or so. The headquarters of the Statistical Department, the Controller of Trading Accounts, the Capital Issue Committee, and the War Insurance Accounts Branch will remain at Gwydyr House, Whitehall, S.W. 1; the Finance Department at Whitehall Gardens, S.W. 1; and the Bankruptcy Department in Horse Guards Avenue, S.W. 1 (telephone No.: Victoria, 3840).

DR. E. G. LOVE.—The death is announced, at the age of 60 years, of Dr. Edward G. Love, treasurer of the American Chemical Society, and one of the best-known figures among American chemists. Dr. Love, who served as a drummer boy in the Civil War in 1864, was appointed on the completion of his studies, the first gas examiner for New York City. Establishing an analytical laboratory, he became analyst to the New York State and City Boards of Health, and was recognised as a high authority on the chemical testing of foods. In 1913, the Consolidated Gas Co. appointed him its chief chemist, whereupon he gave up his official connection with the city and his private practice. He proved as efficient in the making of gas as he had previously been in its analysis. It was largely due to his efforts that the company was able to separate its toluene for the use of the Government in the manufacture of T.N.T., and to help to meet the urgent demand for high explosives. He was a member of several learned societies, and served as president of the New York Chemists' Club in 1902, and for many years as chairman of its house committee. One of his most valuable pieces of work was the establishment and organisation of the American Chemical Society's library, now incorporated with that of the Chemists' Club.

## References to Current Literature

Only articles of general as distinct from specialised interest are included and given in alphabetical order under each geographical subdivision. By publishing this digest within two or three days of publication or receipt we hope to save our readers time and trouble; in return we invite their suggestions and criticisms. The original journals may be consulted at the Patent Office or Chemical Society's libraries. A list of journals and standard abbreviations used will be published at suitable intervals.

### British

- FINE CHEMICALS.** Laboratory chemicals of domestic origin. M. O. Forster. *Chem. Trade J.*, November 8, 501-502. A plea for the organised production of these chemicals in Great Britain.
- PATENTS.** The present position of British Patent Law: II, The "working" clauses of the new Patents Bill. H. E. Potts. *J. Text. Inst.*, November, 308-310.
- STEEL.** Method for estimating phosphorus in steel containing vanadium. J. Maitchell. *Chem. News*, November 7, 212-213.
- TRADE.** The policy of trading with the Central Powers. S. Cutler. *Gas J.*, November 8, 317-320. An interesting paper and discussion on the subject.

### American

- ADVERTISING.** The chemical laboratory as a publicity factor. R. P. Fischelis. *J. Ind. Eng. Chem.*, October, 929-930. Address at the Annual Meeting of the American Chemical Society.
- ARSENIC.** Modification of Pearce's method for arsenic. J. Waddell. *J. Ind. Eng. Chem.*, October, 939-941. Burnett's and Canby's modifications of Pearce's method for determining arsenic have been further modified to give concordant results.
- BUILDING MATERIALS.** A comparison of the heat-insulating properties of materials used in fire-resisting construction. W. A. Hull. *U.S. Bureau Standards, Tech. Paper* 130. A study of a wide range of materials is recorded.
- CARBON.** Improved method for determining carbon by wet combustion, using barium hydroxide as absorbent. P. L. Hibbard. *J. Ind. Eng. Chem.*, October, 941-943.
- DURALUMIN.** The heat treatment of duralumin. P. D. Merica, R. G. Waltenberg, and H. Scott. *U.S. Bureau Standards, Sci. Paper* 347. The best conditions for the heat treatment have been worked out.
- EFFLUENTS.** Stream pollution and its relation to the chemical industry. E. B. Phelps. *J. Ind. Eng. Chem.*, October, 928-929.
- FLUORINE.** A critical study of the potassium and sodium double salts of lead tetrafluoride as sources of fluorine. G. L. Clark. *J. Amer. Chem. Soc.*, October, 1477-1491.
- GAS.** Application of the interferometer to gas analysis. J. D. Edwards. *U.S. Bureau Standards, Tech. Paper* 131.

- HYDROGEN.** Preparation and testing of hydrogen of high purity. J. D. Edwards. *J. Ind. Eng. Chem.*, October, 961-963. The preparation of hydrogen containing not more than 1 part of impurities in 10,000 by the zinc and acid method is described.
- IRON.** The hydrochloric acid colour method for determining iron. J. C. Hostetter. *J. Amer. Chem. Soc.*, October, 1531-1543. The yellow colour produced by dissolving iron in hydrochloric acid is utilised as the basis of a quantitative method.

- NITROGEN FIXATION.** Equilibrium studies on the Bucher process. J. B. Ferguson and P. D. V. Manning. *J. Ind. Eng. Chem.*, October, 946-950.

- PAPER.** The estimation of fibres in paper. R. C. Griffin. *J. Ind. Eng. Chem.*, October, 968-970.

- PATENTS.** Symposium on annual patent renewal fees. *J. Ind. Eng. Chem.*, October, 930-938. A discussion of the subject at the Annual Meeting of the American Chemical Society, with contributions by E. J. Prindle, E. Thomson, L. V. Redman, R. L. Stinchfield, E. A. Hill, W. R. Whitney, A. D. Little, J. M. Francis, T. H. Anderson, T. B. Wagner, J. U. Lloyd, and L. H. Backland.

- PETROLEUM.** The genesis of petroleum as revealed by its nitrogen constituents. C. F. Mabery. *J. Amer. Chem. Soc.*, October, 1690-1697. The animal or vegetable origin of the nitrogenous constituents indicates a similar origin for the hydrocarbons of petroleum.

**REFRACTORIES.** Refractory materials and high temperature measurements. C. W. Kanolt. *J. Franklin Inst.*, October 489-505. A discussion of the use of various refractory materials in pyrometry.

**STEAM.** Industrial uses of superheated steam. A. Bradley. *Blast Fur. and Steel Plant*, October, 519-522. Some of the advantages and economies resulting from the use of superheated steam are enumerated.

**STEEL.** Electric furnaces in the steel industry. *Blast Fur. and Steel Plant*, October, 498-500. A report of the Electrical Furnace Committee of the Association of Iron and Steel Electrical Engineers.

Practical notes on physical tests of steel. N. B. Wilson. *Blast Fur. and Steel Plant*, October, 500-502. These notes deal with hardness and impact tests.

### German

**FATS.** Chemistry and industry of fats in 1914-1918. A Grün. *Chem.-Zeit.*, October 21, 717-718. This first part of a serial discusses the economic condition of the German fat industry.

**FURNACES.** Contribution to the knowledge of oil-fired smelting furnaces. W. Schulte. *Metall. u. Erz.*, August 8, 339-342. The advantages of oil-firing are discussed and a number of tests described.

**GAS.** Rules for tests on gas-producer furnaces. K. Bunte and A. Vichoff. *J. Gasbeleucht.*, October 4, 588-589. An attempt to promote standard methods of testing the operation of producers.

Directions for estimating the calorific value of coal gas by means of Junher's calorimeter. K. Bunte and E. Czakó. *J. Gasbeleucht.*, October 4, 589-593.

**PUMP.** An automatic mercury pump for high vacua, with means for collecting the gases removed. A. Beutell and P. Oberhofer. *Chem.-Zeit.*, October 16, 705-706.

**TAR OILS.** The constituents of bituminous tar oils rich in sulphur (ichthyl oils). H. Scheibler. *Ber.*, October 15, 1903-1910.

**ZINC.** Utilisation of ores, residues, and ashes containing small quantities of zinc. Wöbling. *Metall. u. Erz.*, September 22, 420-422. Possible methods of utilising these products are indicated.

Influence of pressure in zinc retorts on the output of metal. O. Mühlhaeuser. *Metall. u. Erz.*, August 22, 303-373.

### German Aniline Dye Shares

Down to last month the share capital of the German aniline dyestuff industries, it is stated, amounted to 371.2 million marks. The average quotation of the share was 500 per cent., so that an amount of about 1.9 milliard marks, or less than £19,000,000, would have been sufficient for purchasing the whole German aniline dyestuff industry by foreigners. As a matter of fact, Swiss, Dutch, and Allied buyers since the war have purchased German aniline dye shares, for which they paid very high prices, of course in German marks, which were very cheap for them. This situation became dangerous from the German point of view, and in order to stop it the six leading aniline dyestuff firms have taken the following action during the last weeks. First of all, they doubled the share capital by issuing 371.2 million marks of new shares practically at par, namely, 107 per cent., thus watering the capital. Foreseeing the possibility of a purchase of a majority of the doubled watered capital by foreigners, they created Preferential shares, of a nominal amount of 300,000,000 marks, having double the voting power of the Ordinary shares. These Preferential shares will yield an interest of 3½ per cent. only, and will remain in the portfolios of the aniline dyestuff factories. In this way the majority of the voting power of each German aniline dyestuff factory will be in the portfolio of the other five companies. The effect of this measure is easily understood; all the foreigners who have purchased German aniline dyestuff shares for the purpose not only of enjoying a dividend, but of controlling this German standard industry, have been out-maneuvered; the real control remains with the German aniline dyestuff combine. The six firms have mutually guaranteed to themselves the national German character.

## Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. A list of International Convention specifications open to inspection before acceptance is added, and abstracts are given as soon as possible.

### Abstracts of Complete Specifications

**110,874. COMBUSTIBLE GASES FROM CARBONACEOUS MATERIAL, PROCESS AND APPARATUS FOR MAKING.** C. S. Palmer, Pittsburgh, Pa., U.S.A. International Convention date (U.S.A.), October 5, 1917.

Bituminous material is confined in a chamber having thin walls preferably composed of metals in the "iron group" in Mendelejeff's table, which are non-corrosive when heated to 1,100° C. The charge is heated externally by hot gases, and superheated steam at a temperature above 750° C. is passed through it after all the volatile matter has been expelled. Water gas is produced in the chamber. The walls of the chamber are preferably composed of a nickel-chromium-iron alloy.

**120,045. HYDROGEN PEROXIDE, PROCESS FOR THE SYNTHETIC PRODUCTION OF—AND APPARATUS THEREFOR.** R. Moritz, 16, Rue Labelonye, Chatou, France. International Convention date (France), May 15, 1917.

Hydrogen peroxide is produced by the action of palladium, or an alloy of palladium saturated with hydrogen, on a solution of oxygen in water. An endless ribbon is saturated with hydrogen, which may be obtained electrolytically or in admixture in water gas. The hydrogenated ribbon is passed through an iron tube lined with ebonite, and containing water or weak hydrogen peroxide, which is kept saturated with oxygen under pressure. In a modification, hydrogen or a hydrogen mixture is passed continuously under pressure through a tube of palladium or alloy immersed in water or weak hydrogen peroxide saturated with oxygen under pressure. In another modification a current of water saturated with oxygen is electrolysed between a cathode of palladium and an inert anode of platinum, gold, graphite, or the like.

**121,455. CARBAZOLE, PROCESS FOR THE PRODUCTION OF HIGH PERCENTAGE.** Société d'Éclairage Chauffage et Force Motrice, 22, Rue de Calais, Paris. International Convention date (France), December 4, 1917.

Crude carbazole is dissolved in phenols, cresols, xylenols, or other homologues of phenol, either alone or in admixture. The preferred solvent is a mixture of cresols and xylenols, obtained when fractionating rohkresol during the manufacture of pure carbolic acid. The solution is filtered while hot, and the crystals are washed with cresols or the like. The carbazole may be re-crystallised from phenols to obtain a concentration of 90 per cent. The crude carbazole to be treated may be obtained from the potassium derivative resulting from the treatment of crude anthracene with caustic potash. Alternatively, the starting material may be the residue obtained by distilling the pyridine liquor from the process of concentrating anthracene.

**133,336. TITANIUM COMPOUNDS, PREPARATION OF.** H. Wrigley, H. Spence, and Peter Spence & Sons, Ltd., all of Manchester Alum Works, Manchester. Application date, October 16, 1917.

Sulphuric acid of sp. gr. 1.75 is heated to about 160° to 170° C. by means of superheated steam. About three times the theoretical equivalent of ground ilmenite is added, the mixture is agitated, and steam is continuously passed through till the solution is of the desired strength. The resulting solution of titanium and iron sulphates is reduced by means of metallic iron and the ferrous sulphate eliminated by crystallisation. The titanous sulphate may be further purified by refrigeration and crystallisation of a further quantity of ferrous sulphate. The undissolved ilmenite may be treated over again.

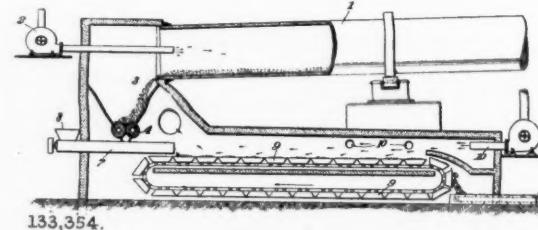
**133,353. CELLULOSE ACETATE, MANUFACTURE OF COMPOSITIONS, PREPARATIONS, OR ARTICLES HAVING A BASIS OF.** H. Dreyfus, 8, Waterloo Place, London, S.W. Application date, April 29, 1918.

In the manufacture of non-inflammable celluloid or other substances from cellulose acetate, solvents having a boiling-point

above 300° C. are required. The specification describes solvents of which the principal constituents are toluene-o-monoethyl sulphonamide or toluene-o-monomethyl sulphonamide. Triphenyl or tricresyl phosphate or certain aliphatic urea derivatives may also be added. See also 132,283, in THE CHEMICAL AGE of October 18.

**133,354-5. CALCIUM CARBIDE, MANUFACTURE OF.** F. M. Becket, Niagara Falls, N.Y., U.S.A. Application date, April 30, 1918.

**133,354.** Lime is burned in the kiln 1, which is of ordinary rotary type, by means of fuel injected by the blower 2. The hot lime 3 passes between crushing rolls 4 to a conveyor 7, where it is mixed with bituminous coal from the hopper 8. The hot



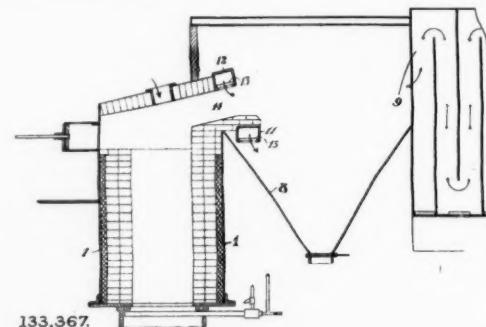
133,354.

mixture is delivered on to an endless chain conveyor 9, where it is coked without agitation or stirring. Additional means for supplying heat are shown at 10, so that the mixture is subjected to increasing temperature in passing through the furnace. The product is suitable for treatment in a carbide furnace.

**133,355.** The above process is modified by mixing unburned limestone with bituminous coal, and then coking the mixture in a furnace similar to the above.

**133,367. BASIC LEAD SULPHATE, PRODUCTION OF.** S. B. Wilson and Purex, Ltd., Greenford, Middlesex. Application date, July 4, 1918.

Lead sulphide is volatilised in a furnace 1 in the absence of oxygen, and the vapour passes through the outlet 14, where it meets a stream of air from the conduit 12, and is oxidised in the



133,367.

chamber 8. Additional air is supplied by the conduit 11, and both conduits open downwards to avoid choking with deposit. Deposited material is collected in the chamber 8, and the gases pass into the cooler 9. Regulating dampers 13 may be provided.

**133,374. GLYCEROL, MANUFACTURE OF.** J. R. Eoff, 725, Shepherd Street, N.W., Washington, D.C., U.S.A. International Convention date (U.S.A.), July 21, 1917.

Fermentable sugar is maintained at about 37° C., rendered alkaline with sodium carbonate, and a "starter" prepared from

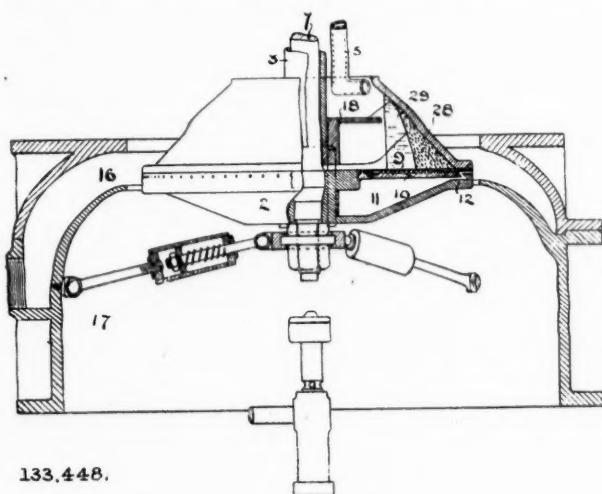
California wine yeasts is added. Further alkali is gradually added during fermentation, in quantity insufficient to stop the activity of the yeast. About 30 per cent. of the sugar is converted into glycerol.

133,434. LIQUID FUEL FOR INTERNAL COMBUSTION ENGINES, AND PROCESS FOR PREPARING THE SAME. A. de-feo Lopez, 2937, Montañeses Street, Buenos Aires. Application date, October 8, 1918.

Alcohol is bubbled through a mixture of sulphuric acid and alcohol at  $100^{\circ}$  to  $150^{\circ}$  C., and the etherealised distillate is rectified and mixed with 10 to 40 per cent. of ordinary alcohol and 5 to 30 per cent. of any suitable distilled hydrocarbon oil. The resulting fuel has a sp. gr. of 0.73 to 0.78.

133,448. CENTRIFUGAL SEPARATION. W. Mauss, 72, Cullinan Building, Main and Simmonds Streets, Johannesburg, Transvaal. Application date, October 10, 1918.

The apparatus is specially adapted for filtering slimy materials. The material is supplied by the pipe 5 tangentially on to the inner surface of the cone 1, which is attached to the rotating shaft 3. The base 2 of the filtering vessel is mounted on the concentric shaft 7, and the two shafts are rotated together. The filter cloth 9



133,448.

is supported on the corrugated perforated plate 10, and the filtered liquid passes into the space 11, and then through the passage 12 to the discharge 16. The baffle 18 prevents material from dropping on to the filter cloth 9, and the material collects as a deposit 28 outside the liquid layer 29. To remove the solid material 28, the section 1 and 2 are separated axially by lowering the shaft 7, and the material is discharged into the space 17.

133,452. BITUMINOUS SHALES, CANTEL COALS, AND THE LIKE, PROCESS OF UTILISING RESIDUES FROM. The Broxburn Oil Co., Ltd., 28, Royal Exchange Square, Glasgow, and R. H. Findlater, Broxburn, Linlithgow. Application date, October 11, 1918.

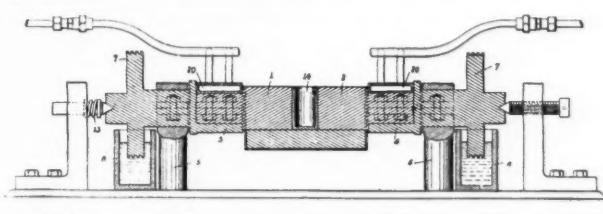
The residue is ground and agitated with water to recover any alkalies, which are decanted. The residue is heated in a digester with sulphuric or other acid, the solution run off, and the residue filtered, washed, and again heated under pressure with caustic soda. The residue, after final washing, may be used as a de-colorising material. A treatment is described for recovering from the acid solution calcium sulphate, aluminium, and iron hydrates, and the acid as an ammonium salt. Alternatively, the residue after the acid treatment may be treated with boiling sodium carbonate solution to recover the silicate.

133,474. POTASSIUM FLUORIDE FROM SILICATE ROCKS, PROCESS FOR THE MANUFACTURE AND PRODUCTION OF. E. D. Dutt and P. C. Dutt, Jubbulpore, India. Application date, October 18, 1918.

Feldspar or the like is treated at  $500^{\circ}$  to  $600^{\circ}$  C. with the vapour of silicon tetrafluoride and water, and the mass lixiviated to dissolve the potassium fluoride.

133,485. ELECTRIC FURNACES. H. A. Kent, The Poplars, Maidstone Road, Bounds Green, London. Application date, October 28, 1918.

The crucible 14 is gripped between graphite electrodes 1, 2, mounted in metal conductors 3, 4, which are journalled in supports 5, 6. Good contact is secured by a spring 13, and cooling



jackets 20 are provided. Current is supplied through mercury in the receptacles 8 to the discs 7. The electrodes may be turned through a right angle in order to empty the crucible.

133,498. MINERAL SELECTIVE AND FROTHING AGENT AND PROCESSES OR METHODS OF PRODUCING AND USING THE SAME. E. C. R. Marks, London. (From Luckenbach Processes Inc., 57, Post Street, San Francisco, Cal., U.S.A.) Application date, November 4, 1918.

A frothing and selective agent for the separation of ores of gold, silver, copper, lead, zinc, nickel, &c., is made by macerating and boiling greasewood in caustic soda or other alkali. Other frothing agents, such as creosote or oleic acid, may be added.

133,554. LOW TEMPERATURE CARBONISATION SYSTEM OF. J. A. Yeadon, 4, Albion Place, Leeds, and T. Whitaker, Westminster Chambers, East Parade, Leeds. Application date, January 4, 1919.

Finely granulated dry coal is continuously fed into the smaller end of a tapering retort. The retort rotates on a horizontal axis, and is provided with longitudinal corrugations, so that the coal is distilled at a low temperature without internal stirring, and is then discharged at the larger end of the retort.

#### International Specifications Open to Inspection

132,229. SYNTHETIC RESINS. Koppers Co., Union Arcade, Grant Street, Pittsburgh, Pa., U.S.A. International Convention date, September 6, 1918.

Crude solvent naphtha is treated with sulphuric acid to polymerise the dicyclopentadiene and styrolene only. The unpolymerised coumarone and its homologues and indene are distilled off, and treated with stronger sulphuric acid to polymerise the coumarone, &c. The acid is neutralised, the oily layer separated, and the oil distilled off, leaving a light-coloured resin.

132,232. ELECTRIC FURNACES. E. Piquerez, St. Ursanne, Jura Cernois, Switzerland. International Convention date, September 2, 1918.

A number of carbon resistance rods are arranged in horizontal quartz tubes above the charge to be heated, and nitrogen is passed through the tubes when the furnace is in operation.

132,245. HALOGEN COMPOUNDS. Chemische Fabrik Flora, Dubendorf, Switzerland. International Convention date, August 31, 1918.

Amines or aminocarboxylic acids are treated with hydrobromic or hydrochloric acid, and nitric acid or a nitrate, or alternatively with a mixture of bromides or chlorides and nitric acid. The amino group is replaced by the halogen. The treatment of leucine to prepare  $\alpha$ -chlor- or  $\alpha$ -brom-isobutylic acid, and other examples are given.

132,260. CONCENTRATING ORES. T. H. Palmer, 360, Collins Street, Melbourne, and H. V. Seale and R. D. Nevett, Junction North Mine, Broken Hill, N.S.W., Australia. International Convention date, September 2, 1918.

Ores such as mixed sulphides are selectively separated by a flotation process in the presence of a small proportion of free sulphur, either mechanically mixed or in solution in oils, tar, &c., with or without a frothing agent.

132,483. CHLORAMINE COMPOUNDS. R. Buratti, Croce Mosso, Novara, Italy. International Convention date, June 11, 1917.

Hexamethylene-tetramine is treated with an alkali or alkaline earth hypochlorite which has been neutralised with boric acid or other weak mineral or organic acid. Tetrachloramine or other chloramines may thus be prepared.

132,490. DESTRUCTIVE DISTILLATION. F. P. A. Rousseau, 11, Rue Guesnault, Vendôme, Loir et Cher, France. International Convention date, September 9, 1918.

Substances such as coal, shale, lignites, residues, resin, pitch, &c., are distilled in a series of vessels heated at the top. The volatile products are drawn off from the bottom of each vessel into a central condenser also heated at the top. A current of hydrogen may be circulated through the distillation vessels to remedy any deficiency of hydrogen in the material. The product is a liquid hydrocarbon, such as petroleum or spirit.

132,496. MANURES. Norsk Hydro-Elektrisk Kvaalstofaktieselskab, 7, Solligatan, Christiania. International Convention date, September 13, 1918.

Insoluble phosphates are rendered soluble by mixing with urea salts, such as the nitrate which is obtained by treating cyanamide with nitric acid.

132,504. LIQUID AMMONIA. Norsk Hydro-Elektrisk Kvaalstofaktieselskab, 7, Solligatan, Christiania. International Convention date, September 13, 1918.

Aqueous ammonia is boiled, and the vapour passed through a dephlegmating column to a superposed reflux condenser. The dry ammonia gas passes to condenser at 25° C., where it is liquefied under 10 atmospheres pressure.

132,510. AMMONIUM ALUM. R. Gans, 9, Konigsallee, Grunewald, Berlin. International Convention date, September 21, 1917.

Aluminium sulphate solution containing ferric sulphate is mixed with ammonia and an excess of ammonium sulphate. A basic ferric salt is formed, which is soluble in the excess of ammonium sulphate, and pure ammonium alum is crystallised out.

132,529. ACETALDEHYDE; PARALDEHYDE; ACETIC ACID; ETHYL ALCOHOL. Soc. des Acieries et Forges de Firmigny, Paris. International Convention date, March 31, 1918.

Acetaldehyde is prepared by passing acetylene through sulphuric acid containing mercury, iron, and vanadium compounds. The aldehyde vapour is polymerised by treating with sulphuric acid, the paraldehyde is separated, and depolymerised by boiling sulphuric acid, and the aldehyde vapour is oxidised to acetic acid by the aid of a copper permanganate catalyst. Aldehyde may be reduced to alcohol by electrolysis, and the ozonised oxygen evolved used for the above oxidation.

#### LATEST NOTIFICATIONS.

134,521. Alcohol, Manufacture of. Elektrizitätswerk Lonza. October 27, 1918.

134,531. Alumina, Method of producing. Norsk Hydro-Elektrisk Kvaalstofaktieselskab. October 26, 1918.

134,536. Selenium and noble metals, Process for recovering—from electrolytic slimes and the like. M. Chikashige and D. Uns. October 28, 1918.

#### Specifications Accepted, with Date of Application

121,591. Metals, Separation and Refining of. G. Haglund. December 19, 1917.

122,397. Pyridine and similar Organic Bases, Methods for Recovering. Barrett Co. January 17, 1918.

123,306. Electric Furnaces. Soc. Electro-Metallurgique Française. February 11, 1918.

123,715. Pulverising Mills. Sturtevant Mill Co. February 23, 1918.

126,270. Preservative Compositions, Manufacture of. M. Holzapfel. May 3, 1918.

126,944. Paranimtracetanilide, Process for Decomposing—to form Paranimtriline. Mitsui Kozan Kabushiki Kaisha. May 16, 1918.

133,722. Sewage and other Impure Liquids, Aeration of. O. Stott and E. R. Jones. May 14, 1918.

133,730. Vertical Retorts, Manufacture of Gas in. C. J. Jackson and Woodall & Duckham. September 10, 1918.

133,753. Magnesite Refractories, Method of Manufacturing. R. D. Pike. October 14, 1918.

133,759. Decolorising and Purifying Agents, and Methods of Making the same. R. W. Mumford. October 14, 1918.

133,770. Photographic Materials, Colour Sensitised. F. F. Renwick and O. Bloch. October 15, 1918.

133,883. Electrolysis, Devices for carrying out Chemical Processes by. V. Gerber. February 20, 1919.

133,918. Nitro-naphthalene, Process for Manufacturing. E. de B. Barnett. May 17, 1919.

#### Patents Court Cases

THE latest date for giving notice of objection to the petition for the extension of the term of Patent 11,215/1906 (see THE CHEMICAL AGE of November 8) is now officially altered to November 27, 1919.

#### Alby United Carbide Factories

##### Patents and Compressed Acetylene

At the annual general meeting, in London, on Tuesday, Major C. H. Campbell (chairman) stated that the profits for the past eighteen months, after providing £34,246 for depreciation, amounted to £25,595 12s., making, with the amount brought forward, a total of £39,727 12s. The dividends on the 5½ per cent. Cumulative Preference shares absorb £4,959 8s. 3d.; and the dividend of 6 per cent. on the Ordinary shares, paid in February, amounted to £27,930 13s. Id., leaving a balance of £6,837 10s. 8d., which the directors recommended should be carried forward. The Chairman reviewed at length the company's position and strongly criticised the Government's attitude towards the company as unfair. He mentioned that excellent progress had been made at the electrode works at Hepburn-on-Tyne, and that the quality of the product had been described as "perfect in every respect." This was of great importance to their works in Norway, where thousands of tons of electrodes were consumed annually.

The company (he said) possess several patents to which the directors attach great value, although they appear in the balance-sheet at a nominal figure. Our technical experts are encouraged to discover and develop in every possible way any process that might prove to be of value in the company's operations, and the directors make a special point of suitably rewarding any of their employees who are successful. The outcome of this policy has been the invention of processes, some of which the directors believe will be of great value in the future. The development of these has been somewhat retarded by the war, but steps are now being taken to demonstrate their practical value, so that we may benefit, not only by their use for our own purposes, but also by their sale to other countries.

Compressed acetylene, owing to the necessities of the war, has at last come into its own. Previously it was only used in a very limited way. Prejudice was largely responsible for this state of affairs, and all sorts of theories were advanced as to why acetylene should not be used. Fortunately, the war changed this, and its use in various forms, not only for lighting, but also in a compressed form, for commercial and industrial use, has resulted in many important developments. Particularly was this the case in aircraft construction, which it completely revolutionised. It was also responsible for speeding-up in some of our most vital industries, including ship-building, ship repairs and welding, even while ships were at sea. No workshop is now considered complete, unless it has this up-to-date outfit for cutting or welding. We can, therefore, confidently look forward to an ever-increasing field of usefulness for compressed acetylene. The interest this has aroused in other countries has been phenomenal. Companies have been formed, particularly in our own Dominions; and your directors have considered it desirable to show their sympathy and support by taking a financial interest in such undertakings.

#### Amalgamation Scheme Approved

Extraordinary general meetings of the Nitrogen Products and Carbide Co., Ltd., and the Alby United Carbide Factories, Ltd., were afterwards held to consider proposals for the amalgamation of the two companies. These proposals were unanimously adopted at both meetings.

**OILFIELDS OF ENGLAND.**—At the statutory general meeting of the Oilfields of England (Ltd.), held on Thursday, October 30, Mr. William Ivey, presiding, said that this was the first British company formed in Great Britain to bore oil in Great Britain itself. There were plenty of oil companies with millions of capital in Great Britain, but up to the present time the whole of this money had been subscribed for development work abroad. In this case, however, the money had been subscribed with the definite object of proving whether oil existed on the Kelham estate in Nottinghamshire, and they had the honour to hold the first licence granted by the British Government for that purpose.

## Monthly Market Report and Current Prices

*Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

### British Market Report

THURSDAY, NOVEMBER 13.

BUSINESS generally is quite satisfactory and there are few changes in price. There has been, perhaps, rather a quieter tendency in the home trade, but the undertone remains firm.

Export business is still as active as recently reported, and considerably more business could be concluded if makers were not so heavily committed for delivery over the next few months.

#### General Chemicals

ACID ACETIC.—Demand continues good at recent prices.

ACID CARBOLIC.—There is still an active demand for this material, and makers are heavily sold, the price being well maintained.

ACID FORMIC.—There seems a little more of this material available, but without change in price.

ACID OXALIC.—Small parcels of foreign make are arriving, and English makers continue well occupied, and maintain their price. ARSENIC is firm, and is scarce on the spot.

BARIUM SALTS are slow of demand, and the price of chloride is again easier.

COPPER SULPHATE.—There is no change in the position, and only a light business has been transacted.

FORMALDEHYDE.—The price is nominally the same as last quoted, but the material is practically unobtainable on the spot.

LEAD ACETATE.—There is a better demand for the white, and the price is inclined to be firmer.

LEAD NITRATE is in better demand and prices higher, in sympathy with the rise in the price of the metal.

LITHARGE.—Makers have again raised their price.

LITHOPONE is steady, and supplies are moving off fairly well.

POTASSIUM CARBONATE is unchanged in price, but supplies are slow in coming to hand.

POTASSIUM BICHROMATE continues in request on export account.

POTASSIUM PRUSSIATE is also firm at last quoted figures.

SODIUM ACETATE is in good demand, and values unaltered.

SODIUM BICHROMATE.—Makers have now booked their price for delivery over next year.

SODIUM CAUSTIC is still heavily wanted on export account, and supplies are scarce.

SODIUM NITRITE continues firm, and very little is available for early delivery. Some good export orders have also been placed.

SODIUM PHOSPHATE is in better demand at higher figures.

SODIUM PRUSSIATE still continues scarce and high in price. In view of the uncertain position, makers are not ready sellers for forward position.

TIN SALTS are only moderately active without change in price.

ZINC SALTS have been in better demand.

#### Coal Tar Intermediates

There is again an interesting market, but for most products works are now heavily sold and near delivery is increasingly difficult to obtain.

ALPHANAPHTHYLAMINE.—Some good business has been done in this material.

ANILINE OIL is very firm, and is becoming increasingly difficult to secure for near delivery.

BETA NAPHTHOL is nominally without change in price, but manufacturers are all heavily sold ahead.

NAPHTHIONATE OF SODA.—There is an increased demand for this product.

#### Heavy Coal Tar Products

The market for all coal tar products remains firm.

BENZOL (90 per cent.) remains firm, at 2s. 1d. per gallon on rails makers' works, and forward business is being quoted at the same figure.

CRESYLIC ACID.—Considerable business is being done, and the price is now 2s. 6d. per gallon, naked at works, for 97-99 per cent. quality, and 2s. 4d. per gallon for 95-97 per cent. quality.

CREOSOTE OIL is in considerable demand, and there is very little available for delivery this year. The price in the North for next year's business is about 6½d. per gallon, and 7½d. in the South.

NAPHTHALENE is also very firm, and the price remains at £7 10s. for crude and £20 per ton for refined.

SOLVENT NAPHTHA.—The position remains unchanged.

HEAVY NAPHTHA.—There is nothing fresh to report.

PITCH.—There is more activity, and there are buyers at 85s. f.o.b. London and 75s. f.o.b. East Coast, while sellers, for the most part, are asking 2s. 6d. per ton more.

#### Sulphate of Ammonia

There is no new feature to report, business being still entirely confined to home trade at the regulation prices.

### French Market Report

Since the date of our last report a fair amount of business has been transacted, but this has now been affected by the exchange question, the parity at time of writing being thirty-eight. This, of course, makes business extremely difficult, but at the same time it is satisfactory to note that German competition in France has not been anything to worry about up to the present.

ACETONE.—There has been a fair demand for this material at approximately £65, c.i.f.

ALUMINIUM SULPHATE.—This material is slow of sale, and is suffering from competition from Germany.

CALCIUM CHLORIDE is better, and a certain amount of business has been transacted.

FORMALDEHYDE.—There is a marked shortage of this material on the French market, and equal to £165 per ton c.i.f. has been paid.

LACTIC ACID.—German makers are also able to beat the English price on this material.

LEAD ACETATE is very active, and some good business has been placed for prompt and forward delivery.

NAPHTHALINE SALTS are still on the quiet side, but business is now slowly improving.

OXALIC ACID.—A number of orders have been placed at a fair price.

SODIUM BICHROMATE is in good demand for near delivery.

SODIUM HYPOSULPHITE is quieter.

SODIUM SULPHIDE has been inquired for, and several good orders have been placed.

ZINC SULPHATE.—This market has revived somewhat, and a fair business has been done at equal to about £24 per ton, c.i.f.

### Current Prices

#### Chemicals

|                                      | per | £   | s. | d. | per | £   | s. | d. |
|--------------------------------------|-----|-----|----|----|-----|-----|----|----|
|                                      | lb. | 0   | 2  | 9  | ton | 0   | 3  | 0  |
| Acetic anhydride .....               | ton | 77  | 0  | 0  | ton | 80  | 0  | 0  |
| Acetone, pure .....                  | ton | 95  | 0  | 0  | ton | 97  | 0  | 0  |
| Acid, Acetic, glacial, 99-100% ..... | ton | 83  | 0  | 0  | ton | 85  | 0  | 0  |
| Acetic, 80% pure .....               | ton | 65  | 0  | 0  | ton | 67  | 10 | 0  |
| Arsenic .....                        | ton | 65  | 0  | 0  | ton | 70  | 0  | 0  |
| Boric, cryst. ....                   | ton | 72  | 10 | 0  | ton | 73  | 10 | 0  |
| Carbolic, cryst. 39-40% .....        | lb. | 0   | 0  | 9  | ton | 0   | 0  | 9½ |
| Citric .....                         | lb. | 0   | 4  | 3  | ton | 0   | 4  | 4  |
| Formic, 90% .....                    | ton | 110 | 0  | 0  | ton | 115 | 0  | 0  |
| Gallic, pure .....                   | lb. | 0   | 6  | 3  | ton | 0   | 6  | 6  |
| Hydrofluoric .....                   | lb. | 0   | 0  | 7  | ton | 0   | 0  | 8  |
| Lactic, 50 vol. ....                 | ton | 70  | 0  | 0  | ton | 72  | 0  | 0  |
| Lactic, 60 vol. ....                 | ton | 85  | 0  | 0  | ton | 87  | 10 | 0  |
| Nitric, 80 Tw. ....                  | ton | 35  | 0  | 0  | ton | 37  | 0  | 0  |
| Oxalic .....                         | lb. | 0   | 1  | 1½ | ton | 0   | 1  | 2  |
| Phosphoric, 1.5 .....                | ton | 40  | 0  | 0  | ton | 42  | 0  | 0  |

|                                       | per   | £   | s. | d. | per           | £   | s. | d.                           | per                             | £   | s. | d. |   |
|---------------------------------------|-------|-----|----|----|---------------|-----|----|------------------------------|---------------------------------|-----|----|----|---|
| Acid, Pyrogallic, cryst.              | lb.   | 0   | 11 | 6  | to            | 0   | 11 | 9                            | Sodium, Perborate               | lb. | 0  | 2  | 2 |
| Salicylic, Technical                  | lb.   | 0   | 2  | 0  | to            | 0   | 2  | 2                            | Pruessiate                      | lb. | 0  | 1  | 0 |
| Salicylic, B.P.                       | lb.   | 0   | 2  | 9  | to            | 0   | 3  | 0                            | Sulphide, crystals              | ton | 16 | 0  | 0 |
| Sulphuric, 92-93%                     | ton   | 7   | 10 | 0  | to            | 8   | 0  | 0                            | Sulphide, solid, 60-62%         | ton | 22 | 10 | 0 |
| Tannic, commercial                    | lb.   | 0   | 3  | 0  | to            | 0   | 3  | 3                            | Sulphite, cryst.                | ton | 11 | 10 | 0 |
| Tartaric                              | lb.   | 0   | 3  | 3  | to            | 0   | 3  | 4                            | Strontium carbonate             | ton | 85 | 0  | 0 |
| Alum, lump                            | ton   | 17  | 15 | 0  | to            | 18  | 0  | 0                            | Nitrate                         | ton | 85 | 0  | 0 |
| Alum, chrome                          | ton   | 95  | 0  | 0  | to            | 97  | 0  | 0                            | Sulphate, white                 | ton | 8  | 10 | 0 |
| Alumino ferric                        | ton   | 8   | 10 | 0  | to            | 9   | 0  | 0                            | Sulphur chloride                | ton | 38 | 0  | 0 |
| Aluminium, sulphate, 14-15%           | ton   | 14  | 10 | 0  | to            | 15  | 0  | 0                            | Flowers                         | ton | 24 | 0  | 0 |
| Aluminium, sulphate, 17-18%           | ton   | 18  | 0  | 0  | to            | 18  | 10 | 0                            | Roll                            | ton | 23 | 0  | 0 |
| Ammonia, anhydrous                    | lb.   | 0   | 1  | 9  | to            | 0   | 2  | 0                            | Tartar emetic                   | lb. | 0  | 3  | 4 |
| Ammonia, .880                         | ton   | 32  | 10 | 0  | to            | 37  | 10 | 0                            | Tim perchloride, 33%            | lb. | 0  | 2  | 4 |
| Ammonia, .920                         | ton   | 20  | 0  | 0  | to            | 24  | 0  | 0                            | Perchloride, solid              | lb. | 0  | 2  | 6 |
| Ammonia, carbonate                    | lb.   | 0   | 0  | 6  | $\frac{1}{2}$ | to  | —  | Pro.ochloride (tin crystals) | lb.                             | 0   | 1  | 9  |   |
| Ammonia, chloride                     | ton   | 65  | 0  | 0  | to            | 70  | 0  | 0                            | Zinc chloride, 102 Tw.          | ton | 22 | 0  | 0 |
| Ammonia, muriate (galvanisers)        | ton   | 44  | 0  | 0  | to            | 45  | 0  | 0                            | Chloride, solid, 96-98%         | ton | 50 | 0  | 0 |
| Ammonia, nitrate                      | ton   | 45  | 0  | 0  | to            | 50  | 0  | 0                            | Oxide, 99%                      | ton | 77 | 10 | 0 |
| Ammonia, phosphate                    | ton   | 115 | 0  | 0  | to            | 120 | 0  | 0                            | Oxide, 94-95%                   | ton | 60 | 0  | 0 |
| Ammonia, sulphocyanide                | lb.   | 0   | 1  | 10 | to            | 0   | 2  | 0                            | Dust, 90%                       | ton | 70 | 0  | 0 |
| Amyl, acetate                         | ton   | 270 | 0  | 0  | to            | 2   | 0  | 0                            | Sulphate                        | ton | 21 | 10 | 0 |
| Arsenic, white, powdered              | ton   | 60  | 0  | 0  | to            | 62  | 0  | 0                            | Oxide, Redseal                  | ton | 75 | 0  | 0 |
| Barium, carbonate                     | ton   | 12  | 0  | 0  | to            | 12  | 10 | 0                            | to                              | 80  | 0  | 0  |   |
| Barium, carbonate, 92-94%             | ton   | 13  | 0  | 0  | to            | 14  | 0  | 0                            | Coal Tar Intermediates, &c.     |     |    |    |   |
| Chlorate                              | lb.   | 0   | 1  | 3  | to            | 0   | 1  | 4                            | Alphanaphthol, crude            | lb. | 0  | 3  | 0 |
| Chloride                              | ton   | 21  | 0  | 0  | to            | 22  | 0  | 0                            | Alphanaphthol, refined          | lb. | 0  | 3  | 6 |
| Nitrate                               | ton   | 50  | 0  | 0  | to            | 51  | 0  | 0                            | Alphanaphthylamine              | lb. | 0  | 2  | 7 |
| Sulphate, blanc fixe, dry             | ton   | 25  | 10 | 0  | to            | 26  | 0  | 0                            | Aniline oil, drums free         | lb. | 0  | 1  | 2 |
| Sulphate, blanc fixe, pulp            | ton   | 15  | 10 | 0  | to            | 16  | 0  | 0                            | Aniline salts                   | lb. | 0  | 1  | 8 |
| Bleaching powder, 35-37%              | ton   | 17  | 10 | 0  | to            | 18  | 0  | 0                            | Anthracene, 85-90%              | lb. | 0  | 1  | 5 |
| Borax crystals                        | ton   | 39  | 0  | 0  | to            | 40  | 0  | 0                            | Benzaldehyde (free of chlorine) | lb. | 0  | 6  | 6 |
| Calcium acetate, grey                 | ton   | 23  | 0  | 0  | to            | 25  | 0  | 0                            | Benzidine, base                 | lb. | 0  | 6  | 6 |
| Carbide                               | ton   | 28  | 0  | 0  | to            | 30  | 0  | 0                            | Benzidine, sulphate             | lb. | 0  | 5  | 6 |
| Chloride                              | ton   | 9   | 0  | 0  | to            | 9   | 10 | 0                            | Benzoic, acid                   | lb. | 0  | 5  | 0 |
| Carbon bisulphide                     | ton   | 58  | 0  | 0  | to            | 59  | 0  | 0                            | Benzoate of soda                | lb. | 0  | 5  | 0 |
| Casein, technical                     | ton   | 80  | 0  | 0  | to            | 83  | 0  | 0                            | Benzyl chloride, technical      | lb. | 0  | 2  | 0 |
| Cerium oxalate                        | lb.   | 0   | 3  | 9  | to            | 0   | 4  | 0                            | Betanaphthol benzoate           | lb. | 1  | 6  | 0 |
| Chromium acetate                      | lb.   | 0   | 1  | 0  | to            | 0   | 1  | 2                            | Betanaphthol                    | lb. | 0  | 2  | 9 |
| Cobalt acetate                        | lb.   | 0   | 7  | 0  | to            | 0   | 7  | 6                            | Betanaphthylamine, technical    | lb. | 0  | 6  | 6 |
| oxide, black                          | lb.   | 0   | 7  | 9  | to            | 0   | 8  | 0                            | Croceine Acid, 100% basis       | lb. | 0  | 4  | 9 |
| Copper chloride                       | ton   | 40  | 0  | 0  | to            | 41  | 0  | 0                            | Dichlorbenzol                   | lb. | 0  | 0  | 5 |
| Sulphate                              | ton   | 245 | 0  | 0  | to            | 250 | 0  | 0                            | Diethylaniline                  | lb. | 0  | 7  | 0 |
| Cream Tartar, 98-100%                 | ton   | 160 | 0  | 0  | to            | 165 | 0  | 0                            | Dinitrobenzol                   | lb. | 0  | 1  | 3 |
| Epsom salts (see Magnesium sulphate)  | ton   | 3   | 0  | 0  | to            | 3   | 5  | 0                            | Dinitrochlorbenzol              | lb. | 0  | 1  | 2 |
| Formaldehyde 40% vol                  | ton   | 70  | 0  | 0  | to            | 72  | 10 | 0                            | Dinitronaphthaline              | lb. | 0  | 1  | 4 |
| Formusol (Rongalite)                  | lb.   | 0   | 4  | 0  | to            | 0   | 4  | 3                            | Dinitrotoluol                   | lb. | 0  | 1  | 7 |
| Glauber salts                         | ton   | 8   | 0  | 0  | to            | 8   | 5  | 0                            | Dinitrophenol                   | lb. | 0  | 1  | 3 |
| Glycerine, crude                      | ton   | 32  | 0  | 0  | to            | 34  | 0  | 0                            | Dimethylaniline                 | lb. | 0  | 3  | 0 |
| Hydrogen peroxide, 12 vols.           | gal.  | 0   | 2  | 8  | to            | 0   | 2  | 9                            | Diphenylamine                   | lb. | 0  | 11 | 6 |
| Iron perchloride                      | ton   | 4   | 10 | 0  | to            | 4   | 15 | 0                            | H-Acid                          | lb. | 0  | 4  | 9 |
| Iron sulphate (Copperas)              | ton   | 83  | 0  | 0  | to            | 85  | 0  | 0                            | Metaphenylenediamine            | lb. | 0  | 9  | 0 |
| Lead acetate, white                   | ton   | 51  | 0  | 0  | to            | 55  | 0  | 0                            | Monochlorbenzol                 | lb. | 0  | 0  | 9 |
| Carbonate (White Lead)                | ton   | 6   | 0  | 0  | to            | 6   | 3  | 0                            | Metanilic Acid                  | lb. | 0  | 7  | 6 |
| Nitrate                               | ton   | 48  | 0  | 0  | to            | 50  | 0  | 0                            | Monosulphonic Acid (2:7)        | lb. | 0  | 7  | 0 |
| Litharge                              | ton   | 44  | 0  | 0  | to            | 46  | 0  | 0                            | Naphthionic acid, crude         | lb. | 0  | 3  | 3 |
| Lithophone, 30%                       | ton   | 15  | 0  | 0  | to            | 16  | 10 | 0                            | Naphthionate of Soda            | lb. | 0  | 4  | 0 |
| Magnesium chloride                    | cwt.  | 2   | 15 | 0  | to            | 3   | 0  | 0                            | Naphthylamin-di-sulphonic-acid  | lb. | 0  | 4  | 6 |
| Carbonate, light                      | ton   | 11  | 0  | 0  | to            | 11  | 10 | 0                            | Nitronaphthaline                | lb. | 0  | 1  | 3 |
| Sulphate (Epsom salts commercial)     | ton   | 17  | 10 | 0  | to            | 18  | 0  | 0                            | Nitrotoluol                     | lb. | 0  | 18 | 0 |
| Sulphate (Druggists')                 | ton   | 89  | 0  | 0  | to            | 90  | 0  | 0                            | Orthoamidophenol, base          | lb. | 0  | 1  | 1 |
| Methyl acetone                        | ton   | 0   | 11 | 6  | to            | 0   | 12 | 0                            | Orthodichlorbenzol              | lb. | 0  | 2  | 2 |
| Alcohol, 1% acetone                   | gall. | 47  | 10 | 0  | to            | 52  | 10 | 0                            | Orthotoluidine                  | lb. | 0  | 1  | 6 |
| Nickel ammonium sulphate, single salt | ton   | 102 | 0  | 0  | to            | 105 | 0  | 0                            | Parahydronaphthalene            | lb. | 0  | 14 | 0 |
| Potassium bichromate                  | lb.   | 0   | 1  | 6  | to            | 0   | 1  | 7                            | Phthalic anhydride              | lb. | 0  | 9  | 0 |
| Carbonate, 90%                        | ton   | 0   | 0  | 0  | to            | 0   | 1  | 0                            | R. Salt, 100% basis             | lb. | 0  | 4  | 0 |
| Potassium Chlorate                    | ton   | 235 | 0  | 0  | to            | 245 | 0  | 0                            | Resorcin, technical             | lb. | 0  | 11 | 0 |
| Meta-bisulphate, 50-52%               | ton   | 59  | 0  | 0  | to            | 61  | 0  | 0                            | Resorcin, pure                  | lb. | 0  | 17 | 6 |
| Nitrate, refined                      | lb.   | 0   | 3  | 3  | to            | 0   | 3  | 6                            | Salicylic acid                  | lb. | 0  | 2  | 9 |
| Permanganate                          | lb.   | 0   | 6  | 0  | to            | 0   | 6  | 3                            | Shaeffer acid, 100% basis       | lb. | 0  | 3  | 6 |
| Prussiate, red                        | lb.   | 0   | 1  | 10 | to            | 0   | 2  | 0                            | Salol                           | lb. | 0  | 4  | 9 |
| Prussiate, yellow                     | lb.   | 0   | 0  | 0  | to            | 0   | 1  | 0                            | Sulphanilic acid, crude         | lb. | 0  | 1  | 3 |
| Sulphate 90%                          | ton   | 31  | 0  | 0  | to            | 33  | 0  | 0                            | Tolidine, base                  | lb. | 0  | 9  | 0 |
| Salammoniac, firsts                   | cwt.  | 4   | 0  | 0  | to            | —   |    |                              | Tolidine, mixture               | lb. | 0  | 2  | 9 |
| Seconds                               | cwt.  | 3   | 15 | 0  | to            | —   |    |                              |                                 |     |    |    |   |
| Sodium acetate                        | ton   | 48  | 0  | 0  | to            | 50  | 0  | 0                            |                                 |     |    |    |   |
| Arsenate, 45%                         | ton   | 50  | 0  | 0  | to            | 52  | 0  | 0                            |                                 |     |    |    |   |
| Bicarbonate                           | ton   | 9   | 0  | 0  | to            | 9   | 10 | 0                            |                                 |     |    |    |   |
| Bichromate                            | lb.   | 0   | 0  | 11 | to            | 0   | 1  | 0                            |                                 |     |    |    |   |
| Bisulphate, 60-62%                    | ton   | 32  | 10 | 0  | to            | 33  | 10 | 0                            |                                 |     |    |    |   |
| Chlorate                              | lb.   | 0   | 0  | 6  | $\frac{1}{2}$ | to  | 0  | 0                            |                                 |     |    |    |   |
| Caustic, 70%                          | ton   | 25  | 0  | 0  | to            | 25  | 0  | 0                            |                                 |     |    |    |   |
| Caustic, 76%                          | ton   | 26  | 10 | 0  | to            | 27  | 0  | 0                            |                                 |     |    |    |   |
| Hydrosulphite, powder, 85%            | lb.   | 0   | 3  | 3  | to            | 0   | 3  | 6                            |                                 |     |    |    |   |
| Hypsulphite, commercial               | ton   | 19  | 10 | 0  | to            | 20  | 0  | 0                            |                                 |     |    |    |   |
| Nitrite, 96-98%                       | ton   | 60  | 0  | 0  | to            | 62  | 0  | 0                            |                                 |     |    |    |   |
| Phosphate, crystal                    | ton   | 0   | 0  | 0  | to            | 32  | 0  | 0                            |                                 |     |    |    |   |

## Miscellaneous and Paint Materials

|  |     |    |    |   |    |    |    |   |
|--|-----|----|----|---|----|----|----|---|
| Barytes                                    | ton | 11 | 0  | 0 | to | 13 | 0  | 0 |
| Casein                                     | ton | 75 | 0  | 0 | to | 80 | 0  | 0 |
| Chalk, precipitated (light)                | ton | 20 | 0  | 0 | to | 24 | 0  | 0 |
| Chalk, precipitated (heavy)                | ton | 10 | 0  | 0 | to | 12 | 0  | 0 |
| China clay (bags extra) (f.o.r. Corn-wall) | ton | 1  | 12 | 6 | to | 3  | 12 | 6 |

|                                 | per  | f. | s. | d. | per | f.  | s. | d. |
|---------------------------------|------|----|----|----|-----|-----|----|----|
| Coke (blast furnace) (S. Wales) | ton  | 2  | 12 | 0  | to  | 2   | 13 | 0  |
| Coke (foundry) (S. Wales)       | ton  | 3  | 5  | 0  | to  | 3   | 6  | 0  |
| Fuller's Earth                  | ton  | 4  | 0  | 0  | to  | 5   | 0  | 0  |
| Lead, litharge flake            | ton  | 48 | 10 | 0  | to  | 50  | 0  | 0  |
| Lead, red                       | cwt. | 2  | 5  | 0  | to  | 2   | 7  | 6  |
| Lead, white                     | cwt. | 2  | 15 | 0  | to  | 2   | 17 | 6  |
| Ultramarine                     | ton  | 90 | 0  | 0  | to  | 110 | 0  | 0  |
| Prussian Blue                   | cwt. | 11 | 0  | 0  | to  | 11  | 10 | 0  |
| Chrome green                    | cwt. | 6  | 5  | 0  | to  | 6   | 10 | 0  |
| Chrome yellow                   | cwt. | 6  | 5  | 0  | to  | 7   | 0  | 0  |
| Mineral black                   | ton  | 10 | 0  | 0  | to  | 12  | 0  | 0  |
| Carbon black                    | lb.  | 0  | 1  | 3  | to  | 0   | 1  | 6  |
| Guignet's Green, 30%            | lb.  | 0  | 1  | 5  | to  | 0   | 1  | 8  |

The following prices are furnished by Messrs. Miles Mole & Co., Ltd., 101, Leadenhall Street, London, E.C.

#### Metals and Ferro-Alloys

|                         |     |     |    |   |    |     |    |   |
|-------------------------|-----|-----|----|---|----|-----|----|---|
| Aluminium, 98-99%       | ton | 150 | 0  | 0 | to | —   |    |   |
| Antimony (English)      | ton | 47  | 10 | 0 | to | 47  | 15 | 0 |
| Copper, best selected   | ton | 113 | 0  | 0 | to | 114 | 0  | 0 |
| Ferro-chrome, 60%       | ton | 55  | 0  | 0 | to | 56  | 0  | 0 |
| Ferro-manganese, 76-80% | ton | 26  | 0  | 0 | to | 27  | 0  | 0 |
| Ferro-silicon, 45-50%   | ton | 25  | 0  | 0 | to | 26  | 0  | 0 |
| Ferro-tungsten, 75-80%  | lb. | 0   | 3  | 0 | to | 0   | 3  | 3 |
| Lead (ingot)            | ton | 33  | 10 | 0 | to | 34  | 0  | 0 |
| Lead (sheets)           | ton | 43  | 10 | 0 | to | 44  | 10 | 0 |
| Nickel, 98-99%          | ton | 210 | 0  | 0 | to | 212 | 0  | 0 |
| Tin                     | ton | 276 | 0  | 0 | to | 278 | 0  | 0 |
| Zinc (spelter)          | ton | 45  | 0  | 0 | to | 46  | 0  | 0 |

#### Structural Steel

|                               |     |    |    |   |    |    |    |   |
|-------------------------------|-----|----|----|---|----|----|----|---|
| Angles and tees               | ton | 17 | 15 | 0 | to | 18 | 0  | 0 |
| Flats and rounds              | ton | 21 | 10 | 0 | to | 22 | 0  | 0 |
| Joists                        | ton | 17 | 15 | 0 | to | 18 | 0  | 0 |
| Plates                        | ton | 20 | 0  | 0 | to | 20 | 10 | 0 |
| Rails, heavy                  | ton | 17 | 0  | 0 | to | 17 | 5  | 0 |
| Sheets, 24 G.                 | ton | 24 | 0  | 0 | to | 25 | 0  | 0 |
| Sheets, galvanised corrugated | ton | 37 | 0  | 0 | to | 37 | 10 | 0 |

#### Building Materials

|                         |          |    |    |    |    |    |    |    |
|-------------------------|----------|----|----|----|----|----|----|----|
| Bricks, stock           | 1000     | 3  | 16 | 0  | to | 3  | 18 | 0  |
| Bricks, blue Staffs     | 1000     | 9  | 4  | 0  | to | 9  | 5  | 0  |
| Firebricks, Stourbridge | 1000     | 10 | 5  | 0  | to | 10 | 10 | 0  |
| Fireclay, Stourbridge   | ton      | 2  | 3  | 0  | to | 2  | 4  | 0  |
| Glass sheet, 21oz.      | ft.      | 0  | 0  | 8½ | to | 0  | 0  | 8½ |
| Lime, ground blue Lias  | ton      | 2  | 10 | 0  | to | 2  | 12 | 0  |
| Lime grey stone         | ton      | 2  | 14 | 0  | to | 2  | 15 | 0  |
| Linseed oil, boiled     | gall.    | 0  | 9  | 9  | to | 0  | 10 | 0  |
| Linseed oil, raw        | gall.    | 0  | 9  | 3  | to | 0  | 9  | 6  |
| Portland cement         | ton      | 3  | 14 | 0  | to | 3  | 17 | 0  |
| Slates, Bangor          | 1200     | 33 | 0  | 0  | to | 35 | 0  | 0  |
| Slates, Portmadoc       | 120      | 18 | 0  | 0  | to | 23 | 0  | 0  |
| Tiles                   | 1000     | 6  | 5  | 0  | to | 6  | 8  | 0  |
| Turpentine              | gall.    | 0  | 11 | 0  | to | 0  | 11 | 6  |
| Yellow pine up to 3×8   | standard | 45 | 0  | 0  | to | 55 | 0  | 0  |
| Yellow pine over 3×8    | standard | 50 | 0  | 0  | to | 60 | 0  | 0  |

#### Alsatian Potash Imports

IMPORTS for the week ending November 8, 259 tons Sylvinitie 20 per cent., and 212 tons Sylvinitie 14 per cent. Prices: Sylvinitie 14 per cent. (French kaolini), £7 per ton; Sylvinitie 20 per cent. (French potash salts), £8 7s. 6d.; Muriate of Potash, 80 per cent., £10 7s. 6d.

#### Agricultural Chemist's Failure

JAMES ALEC HANLEY, agricultural chemist, of 8, Woodsley Terrace, Hyde Park, Leeds, came up for his public examination at the Leeds Bankruptcy Court, on Tuesday. The liabilities were estimated at £941, and the assets, consisting of furniture, at £50.

The debtor stated that he was at present employed by a local authority at a salary of £375. He attributed his present position to the extravagance of his wife, who had contracted debts to the extent of £550 without his knowledge. His wife had always led him to believe that she had private means of her own. He admitted that when only earning £3 a week he had taken a furnished house at Kirkstall at a rent of £60 per annum.

The Official Receiver (Mr. Clifford Eowling) produced tradesmen's bills relating to the purchase of lobsters, peaches, salmon, grapes, and other things, but the debtor said that he had not partaken of any of these luxuries, and added that he did not know that they had been coming into the house.

The examination was subsequently closed.

## The Chemical Age

**Commercial Intelligence**  
The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

#### LONDON GAZETTE.

#### Liquidators' Notices

BERCA (ROUMANIA) OIL CO., LTD.—A general meeting will be held at 34-36, Gresham Street, London, E.C., on Wednesday, December 10, at 3 p.m. Frank Rowley, Liquidator.  
BRITISH PHARMACEUTICAL WORKS, LTD. (In Liquidation.)—A general meeting of members will be held at Threadneedle House, 34, Bishopsgate, London, E.C.2, on Friday, December 12, at 12 noon. H. S. Hope, Liquidator.

#### Partnership Dissolved

SEDDON, William Henry, and SEDDON Alfred, oil, paint, colour, and varnish manufacturers, Globe Oil Works, Green Lane, Kirkstall-upon-Hull, under the style of Seddon Brothers, by mutual consent, as and from October 1, 1919. All deb'ts received or paid by Alfred Seddon, by whom the business will in future be carried on.

#### Notice of Dividend

ROUMANIAN OIL TRADING CO., LTD., 31, Lombard Street, London, Ios. First (to non-enemy creditors). Any day (except Saturday) between 11 and 2, at the office of the Official Receiver and Liquidator, 33, Carey Street, Lincoln's Inn, London, W.C.2.

#### Notice of Intended Dividend

UNION CHEMICAL CO. (WALKDEN) LTD., 20, Cross Street, Manchester, November 26. Liquidator, J. G. Gibson, Official Receiver and Liquidator, Byrom Street, Manchester.

RIDGWAY, JOHN ALFRED, residing at Clifton Villa, Stamford Road, Mossley, Lancs., works' chemist. November 22. Trustee, J. G. Gibson, Official Receiver, Byrom Street, Manchester.

#### Company Winding up Voluntarily

STONEFOLD CHEMICAL CO., LTD.—Mr. G. L. Hansford, Parr's Bank Buildings, York Street, Manchester, Chartered Accountant, appointed Liquidator. Meeting of creditors at the offices of Messrs. Morris, Gregory, Holmes and Hansford, Parr's Bank Buildings, York Street, Manchester, on Friday, November 14, at 10.30.

#### Bills of Sale

[The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of 1882 and under the Act of 1878. Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice has been entered on the Register.]

BARR, JOHN, 2, Rosemount, South Church, Co. Durham, Chemical Engineer.—Filed November 4. £60.

CUTCLIFFE, CHARLES, 8, West Hill Place, Brighton, Sussex, Chemist.—November 5. £400. Balance of purchase money.

#### Mortgages and Charges

[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, created after July 1st, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an \*—followed by the date of the Summary, but such total may have been reduced since such date.]

ASKERN COAL AND IRON CO., LTD.—Registered October 30. Trust Deed dated October 10, 1910, securing £300,000 debentures (filed under section 93 (3) of the Companies (Consolidation) Act 1908), present issue £155,750; charged on freehold and leasehold hereditaments at Askern; also a general charge, except railway wagons. £155,100. April 3, 1918.

CALICO PRINTERS' ASSOCIATION, LTD., MANCHESTER.—Registered November 1, mortgage or charge by way of further security, supplemental to Trust Deed dated November 29, 1900, for securing £3,200,000 First Mortgage Debenture Stock; charged on freehold land and premises at Withnell and Tottington, also Lennoxton, N.B. £3,700,000. October 2, 1918.

DRUG AND CHEMICAL CORPORATION, LTD., LONDON, E.C.—Registered October 31, £3,000 mortgage to M. E. Chisholm, 8, Kennington Park Road, dyer, and another; charged on Crown Dye Works, Lower Kennington Lane, S.E., also general charge.

**Satisfaction**

STAVELEY COAL AND IRON CO., LTD.—Satisfactions registered October 29, £21,200, balance of amount outstanding July 1, 1908; £2,500, registered July 29, 1902; various sums amounting to £14,800, registered June 12, 1908; £800, part of amounts registered February 9, 1909; £93,260, part of amount registered December 4, 1911; and £7,000, registered April 3, 1915.

**County Court Judgment**

[NOTE.—The publication of extracts from the "Registry of County Court judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

HENSON, E. & W., Flag Fen, Peterborough, Fertiliser Manufacturers. £66 los. 2d. October 8.

**New Companies Registered**

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C. 1—

JAY METLISS & SON, LTD., 192, Balls Pond Road, Islington, N.1.—Manufacturer of balata cement. Directors: J. D. Jay, 192, Balls Pond Road, Islington, N.1; A. Metliss, 16, Brondesbury Road, Kilburn, N.W.6; S. Metliss, 16, Brondesbury Road, Kilburn, N.W.6, permanent Directors. Qualification of Directors, 1 share.

COPELAND & WILSON, LTD.—Manufacturing chemists. Nominal capital, £21,000 in 20,000 Preference shares of £1, and 20,000 Ordinary shares of 1s. First Directors: S. Walton; H. Copeland, Lindley House, Spennymoor; G. S. Wilson, "Northend," Alverstone Avenue, Low Fell.

SHORE & CO., LTD.—Ann Strut Works, Rochdale. To carry on the business of tanners and curriers. Nominal capital, £3,000 in 3,000 shares of £1. Directors: F. Shore, 190, Edmund Street West, Rochdale; T. Greenwood, 14, Spotland Road, Rochdale; J. Caladine, 191, Drake Street, Rochdale. Qualification of Directors, £200. Remuneration of Directors: To be voted by Company in General Meeting.

**The Affairs of G. E. E. Newton**

THE statutory first meeting of the creditors of George Edward Ellis Newton (trading as G. E. Newton & Co.), chemical merchant and exporter, 74, Great Tower Street, E.C., was held on Wednesday at Bankruptcy Buildings, Carey Street, W.C.

Mr. W. P. Bowyer, Official Receiver, who presided, reported that according to debtor's statements, in 1916 he took premises at 74, Great Tower Street, where he began to trade as a chemical merchant and exporter, with a borrowed capital of £50. His business had throughout consisted in the securing of orders and then buying the goods, and inasmuch as every transaction was for cash he was not in need of capital. The business proved very successful, and during the first eighteen months he made a net profit of £3,000. About the middle of last year, however, the increased restrictions regarding exports and the Government control over chemicals resulted in a serious falling off. He immediately cut down expenses, dismissing his clerk and taking over the management himself. The business, however, continued to fall away, and on the signing of the Armistice it practically ceased. In the meantime, in order to keep the business going, he had been compelled to have recourse to moneylenders, his profits having previously been tied up. Since the beginning of the present year the business had been a losing one, and, in consequence of illness, he had been put to additional expenditure. In March, moneylenders began to press, and in order to meet some of their claims he sold his house and furniture. He also arranged to dispose of his business to a company which should take over his liabilities, but he asserted that the moneylenders refused to wait, a petition being placed on the file which resulted in the making of the receiving order. At the present time he was acting as manager of a company. No statement of his affairs had yet been filed, but the debtor roughly estimated his liabilities at £2,000, and said that his assets comprised ten tons of red powdered arsenic which were charged to a bank as against loans, and 313 tons of special vacuum salt which were charged to the same bank.

In reply to the chairman, the debtor said that he had no definite offer to submit for the benefit of his creditors, but he thought that a friend might possibly come to his rescue with anything up to £2,500. He had no wish to become a bankrupt, it being his desire to pay everybody in full. The creditors passed a resolution for bankruptcy, and appointed Mr. David Hart, of 12, Regent Street, S.W., as trustee to administer the estate. His fidelity bond was recommended at £100 with an undertaking by him to keep the Official Receiver informed of any realisations which might result in his having more than that amount in his hands.

**For Sale or Wanted**

(Three lines, 3s.; each additional line, 1s.)

SPECTROSCOPES, MICROSCOPES, bought, sold, and exchanged. List free. — John Browning, 146, Strand, W.C.

CARBOLIC ACID Crystals 39/40° 3 drums with over-casks. BICHROMATE OF POTASH, 1 cask of about 6 cwt. Bo h spot delivery. Want to clear. Apply Box No. 30, CHEMICAL AGE Offices, 8, Bouverie Street, E.C. 4.

**Notices**

(Three lines, 3s.; each additional line, 1s.)

**INSTITUTE OF CHEMISTRY OF GREAT BRITAIN AND IRELAND**

QUALIFICATIONS FOR CHEMISTS.—The Institute of Chemistry was founded in October, 1877, and incorporated by Royal Charter in June, 1885, to provide qualifying diplomas (F.I.C. and A.I.C.) for Analytical, Consulting, and Technological Chemists.

EXAMINATIONS will be held at the laboratories of the Institute during January, 1920. The list will be closed on Monday, 24th November, 1919. Exact dates and other particulars will be forwarded to candidates whose applications are accepted by the Council and who intend to present themselves.

REGULATIONS for the Admission of Students, Associates, and Fellows, Gratia.

APPOINTMENTS REGISTER.—A Register of chemists who are available for appointments is kept at the office of the Institute. The facilities afforded by this Register are available to companies and firms requiring the services of Analytical, Research, and Technological Chemists and to Universities, Colleges Technical Schools, &c. requiring Teachers of Chemistry and Technology.

All communications to be addressed to the REGISTRAR, The Institute of Chemistry, 30, Russell Square, London, W.C. 1.

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**CHEMICAL SOCIETY RESEARCH FUND.**

A Meeting of the Research Fund Committee will be held in December next. Applications for Grants, to be made on forms, which can be obtained from the Assistant Secretary, must be received on, or before, Monday, December 1st, 1919. All persons who received grants in December, 1918, or in December of any previous year, whose accounts have not been declared closed by the Council, are reminded that reports must be in the hands of the Assistant Secretary not later than Monday, December 1st.

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